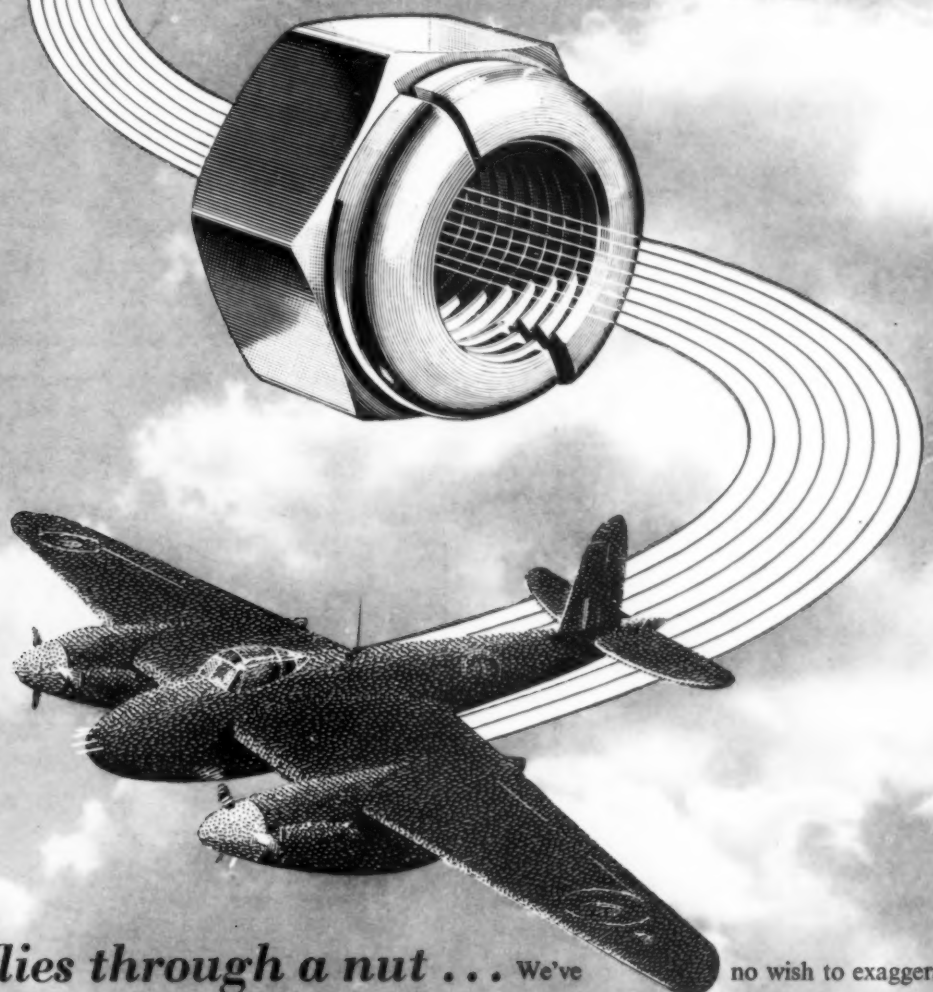
1073 Vol. XLVI NOVEMBER 16th, 1944

FLIGHT

and AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING



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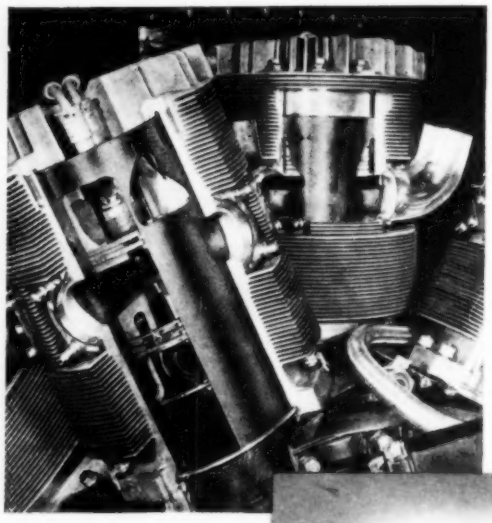

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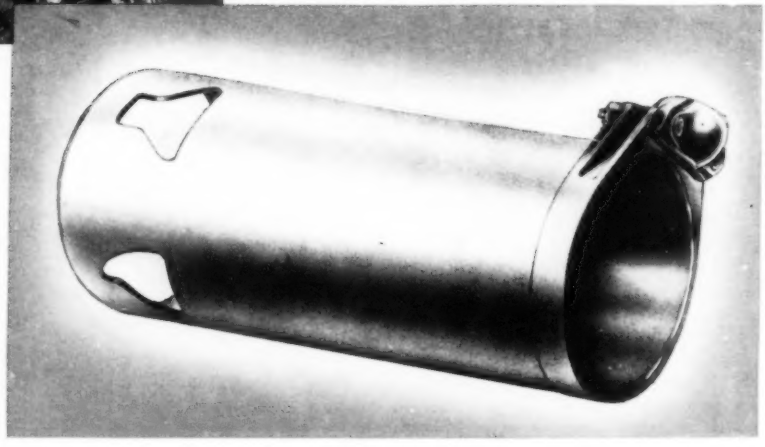

This is one of a series of twelve advertisements prepared for retention, and constitutes a simple story of sleeve-valve advantages. Previous copies are available on request to the Bristol Aeroplane Company Ltd., Bristol.

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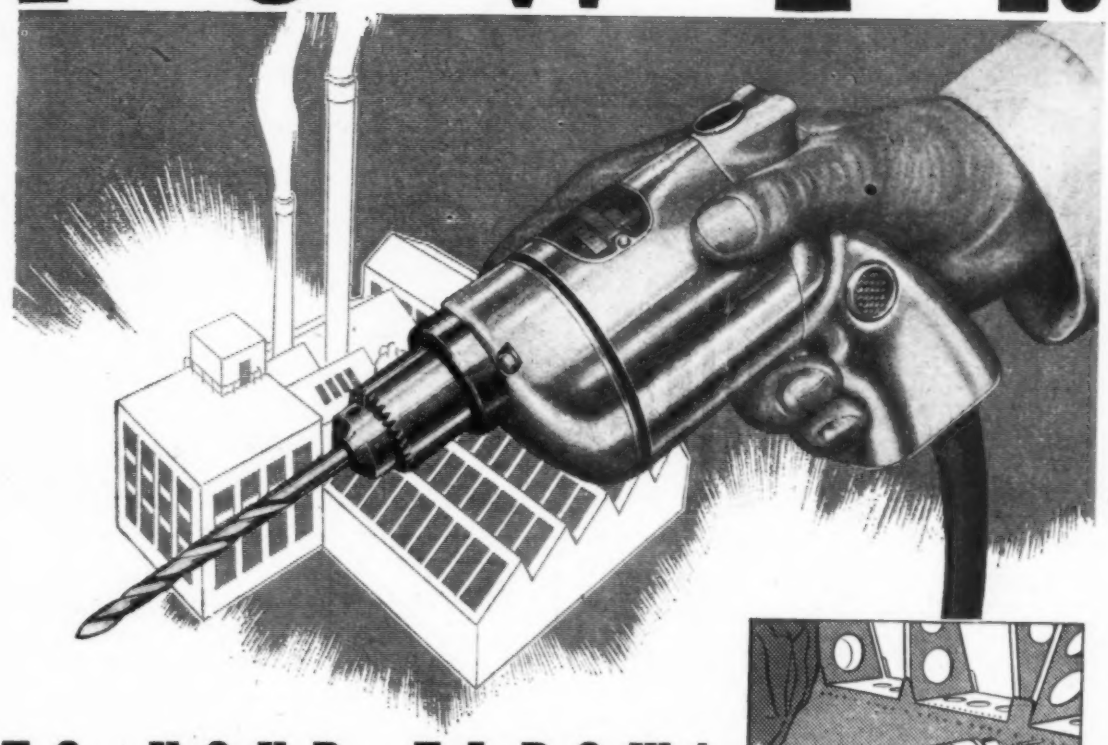

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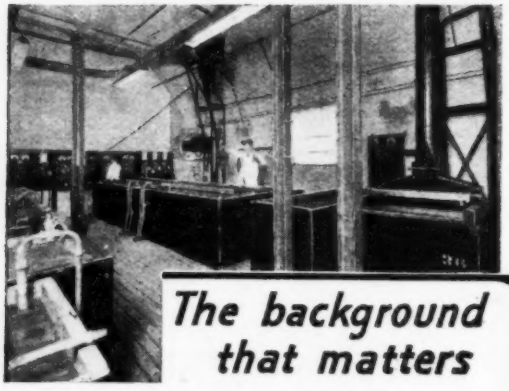

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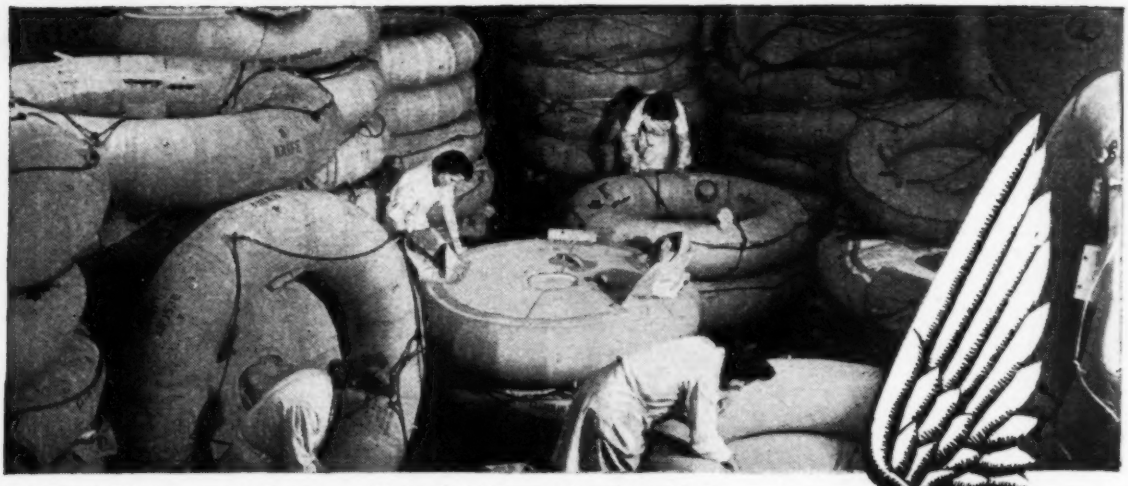

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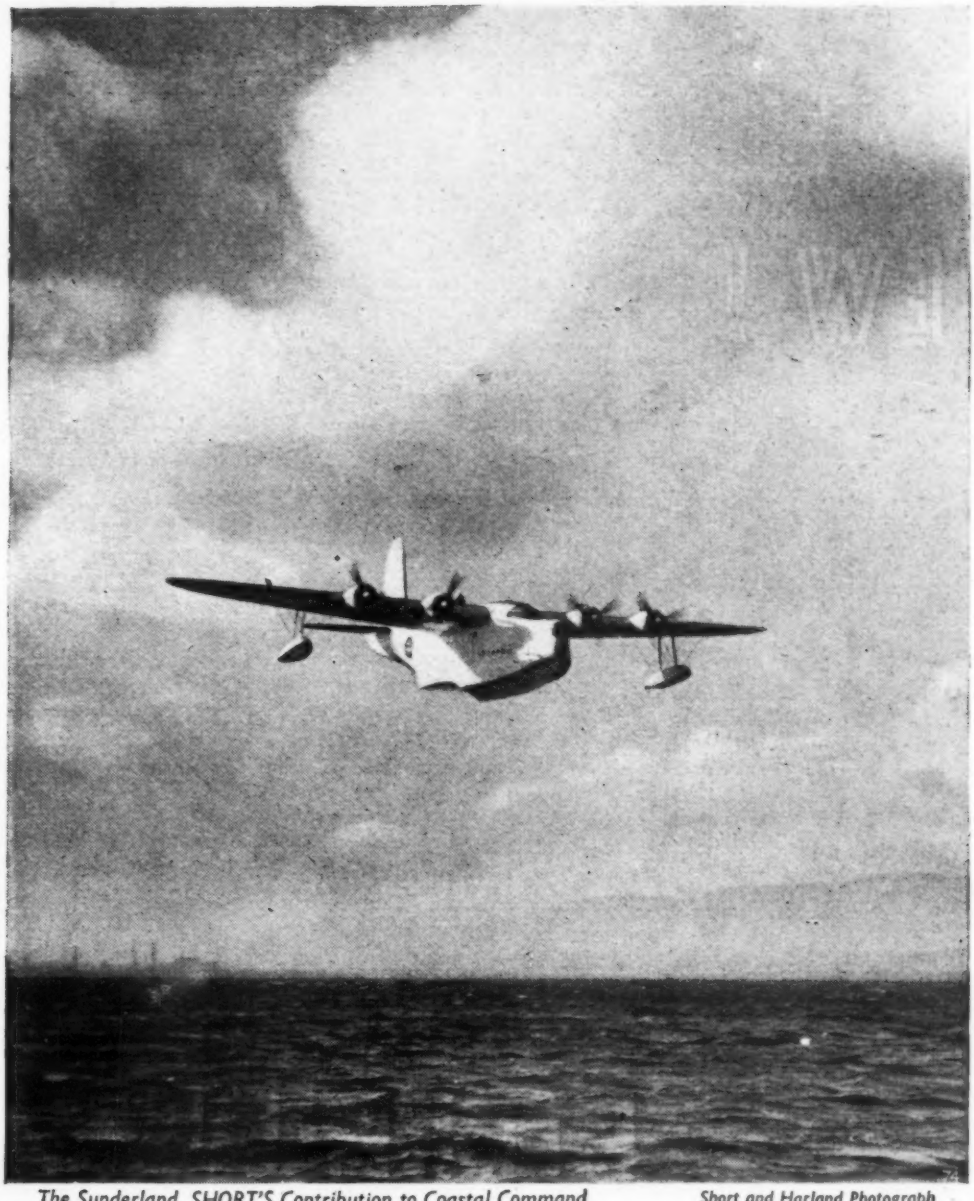

The Sunderland, SHORT'S Contribution to Coastal Command *Short and Harland Photograph*

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FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

The College of Aeronautics

THE report of the Fedden Committee has now been published and ought to be studied by everyone who pretends to any serious interest in the future of British aviation. We on *Flight* have fully realised the urgency of founding a thoroughly adequate establishment for the training of all branches of aviation technicians and have taken our part in the demand for it, a demand which was initiated long ago by Mr. F. G. Miles and Mr. G. Geoffrey Smith, our managing editor, whose views were expressed both in this journal and in *The Daily Telegraph*. The subject is thus one very near to our heart, and let it be said at once that we consider the recommendations of the Fedden report both wise and adequate.

Sir Stafford Cripps has stated that the Government have accepted the report "in principle," and we may hope that it will also be accepted in its general details. No harm is likely to be done by any minor changes that may ultimately be deemed desirable. Indeed, the Fedden Committee is at some pains to stress the fact that the recommendations are intended as a guide rather than as a cut-and-dried scheme.

Essentials of the report are: two types of course, a "long" lasting two years and "short" courses of varying duration; entry of fifty students per annum for the long course and 200 students at any one time on shorter courses, i.e., a total of 300 students at any one time; and the cost of building and equipping the college is estimated at £2,610,000, while the annual cost is thought likely to be £380,000. Except for an annual sum of £20,000 the expenditure will have to be met from the Exchequer. The committee visualises that some £20,000 might be forthcoming by way of revenue from tuition fees. There is, of course, likely to be a certain amount of income from consultation fees, from charges for laboratory work, and possibly from endowments, but in view of the uncertainty of these, the committee has not taken them into account. The suggested annual fee for the long course is £75, with proportionate rates for the shorter courses.

The Price of Things

THERE will probably be some who will hold up their hands in horror and say that an average cost of £1,200 per annum for training a man is extravagant. Put coldly like that this may seem to be so. But nothing has ever been cheap in aviation, and the college is intended to provide high-grade engineering, technical and scientific training in aeronautics to fit students for leadership in the aircraft industry, in civil aviation and the Services, and in education and research. In other words, the college will train those who are to become key men in the future, and their potential value to the nation cannot be assessed in pounds, shillings and pence. British aviation has suffered in the past from niggardly remuneration of some of its best men, and it is high time that this anomalous situation was changed. Too many have had to put up with living meanly for the sake of doing work they love, in which they excel and which is of vital importance to the nation.

One feature of the suggested college which we very heartily endorse is the inclusion of a Department of Flight and Operation. In the past there has been far too little contact between the design and research branches on the one hand and practical flying on the other. Many of our technicians and scientists have scarcely seen an aircraft, let alone flying one or even flying in one, from one year's end to the other. That is bad and tends to dissociate the theoretical from the practical side. There have been exceptions, of course, such as the excellent work done by Professor Sir Melvill Jones at Cambridge. But in the main it can

be said that theoretical investigations have tended to become too abstract, largely through the fact that those engaged on them never fly. It is not, of course, suggested that every research worker should be of test-pilot standard, but a certain amount of personal experience of flying cannot fail to impress the scientist with the fact that in his work he is dealing with very real physical phenomena and not with abstract problems only.

We agree with the Fedden Committee as to the need for the College. We are not surprised that certain witnesses from the aircraft industry were doubtful as to its value to the practical man. British aircraft have more than held their own in spite of our meagre research and training establishments, but times have changed, aircraft have become vastly more complicated, and larger qualified technical staffs will be needed if new designs are to be got out in a reasonable time, to put it no higher than that. And we are just running into new conditions due to the high speeds now being attained.

Runways—In War

UNTIL the advent of the Spitfire on airfields other than those of the peacetime metropolitan establishments, it was considered essential that service aircraft should be sufficiently robust and have such landing characteristics as would enable any open space to be used as an airfield. The continued increase in performance of service types during the war years now makes runways necessary. In other words, whereas at one time the runway was employed for a few specific types, it is only the steel mesh or concrete airstrip which has made the use of highly loaded military aircraft possible. But now a new trouble makes itself apparent. As the number of aircraft employed by the Allies increases so enormously, the choice must be made between congestion on airfields which have runways—either temporary or permanent—and the use of grass airfields. Certainly it is impossible, in the time which we expect to remain in any one area, to lay down even steel mesh runways on all our fields. Road and rail transport is the deciding factor in this, because even a simple temporary runway weighs something over 2,000 tons, without counting in the weight of perimeter tracks and dispersal points.

Actual physical wear of a grass surface, even under ideal conditions of texture and weather, is now a major problem. Transport Command think nothing of operating three or four hundred Dakotas to and from a grass airfield in a few hours, and the runway has to be changed like a cricket pitch.

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Doubtless we are going to have severe airfield problems with which to contend on the Continent this winter. There is, however, one very bright spot. The German, in his certain sureness of never having to fight on his home ground, only has runways on about one-tenth of the 400 airfields under his control, and road and rail transport is his ever-growing difficulty.

—and in Peace

AIRCRAFT designers and airline operators watch the scene with a certain degree of complacency. They think to themselves that at least one good thing will come out of this global war, and that is a large number of surfaced airfields ready and waiting to take the new 100-ton-plus civil aircraft which are already in process of being built.

These hastily built runways—even those of comparatively thick concrete—are not going to take the loads imposed by these giants. A maximum load likely to be experienced during a shock landing of a hundred-tonner is in the region of 250 tons, to which must be added, as a factor of safety, a further 150 tons.

Undercarriages and runways of the future will have a hard task to perform, and it seems certain that we shall lose that advantage of flexibility of route which aircraft have always given hitherto. Before the war, when Imperial Airways were operating flying boats almost exclusively on the Empire routes, they were able to change their actual routes, and frequently had to almost overnight. These modern monsters will be tied down to a few super airfields and, even on these, a swing off the runway or a tyre puncture is quite likely to lead to a serious accident.

ROCKET-ASSISTED TAKE-OFF: A Seafire pilot has just fired his four rockets, which have not yet started to burn. They contain cordite and burn for four seconds, by which time the machine is airborne. **Another picture on page 519.**

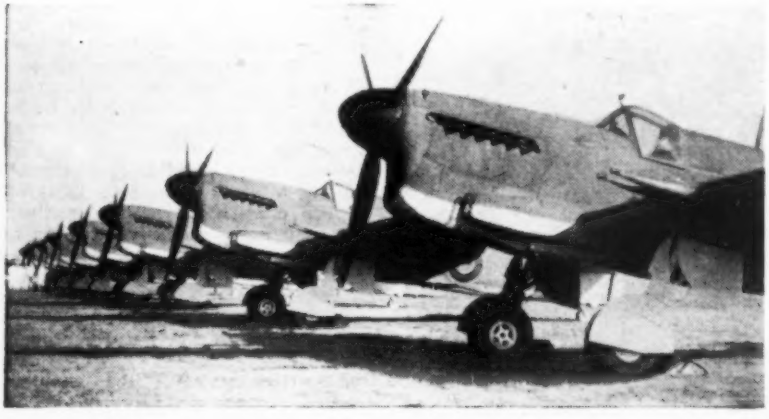
WAR in the AIR

Allied Bombers Strike Near and Far : P.M. on "A Trail of Fire"

PHŒNIX-LIKE : A rocket Typhoon stands amid the wreckage on an airfield in Belgium.

THE best testimony to the effects of its work which Bomber Command could desire is persistent efforts by the Germans to repair the damage. The Germans are indefatigable repairers. If they were not, their military supplies would long ago have been either running short or threatening to do so.

As our readers must have become tired of hearing us expound, communications are just as important as factories. It is not much good making a weapon if one cannot transport it to the place where it can be used. The German railway lines must be now in a very tired condition—at least the rolling stock must be after five years of war work with a minimum of energy spent on repairs and replacements. There are many objections to making much use of the roads, not least among them being the shortage of petrol and fuel oil. Obviously water transport must be used by the enemy as much as possible. Coastal Command can tell how busily the enemy is using coastwise shipping, and how heavily he escorts the merchant vessels with *flak* ships and other armed craft. Inland waterways are no less important, and both rivers and canals are used as much as possible.



FOR NAVAL OCCASIONS : A line of Fairey Firefly reconnaissance fighters. The Firefly has been specially designed to operate from aircraft carriers.

Among German canals that known as the Dortmund-Ems is outstanding. Its name will go down to history on account of the attacks on it by the R.A.F. and the patience with which the Germans have set themselves to repair the breaches in it. It was breached for many miles in September by an attack in which bombs of the 12,000 lb. category were used. By the first week in November the Germans had got it working again, with barges moving along it. So Bomber Command sent Lancasters there again, and this time they only used bombs of normal size. They did the job, however, and once more the canal was drained dry for miles. This latest attack was made at the same spot as that in September. One barge was carried by the rush of water through a gap and left high and dry some distance from the canal. The bargees on board must have had an exciting time. Now, no doubt, the Germans will set to work once more with pick and shovel, but this labour of Sisyphus must be very disheartening.

A flight of Dakotas of the R.A.F., escorted by Mustangs, has flown to Belgrade, carrying Yugoslav partisans and stores. It will be remembered that when Yugoslavia decided that it would profit her nothing to gain German friendship if she lost her own soul, the modern Huns vented their fury by

WAR IN THE AIR

bombing Belgrade much as they had before bombed Rotterdam. The carnage must have been terrible, and the whole civilised world was horrified. Now that outrage belongs to "old unhappy far-off things," and Belgrade is once more in the hands of her own people and of friends. The ruins remain, as in other lands, to mark where the Hun has passed.

Attack from the South

TRAVELLERS (at least those who have not seen Edinburgh) are often divided in opinion as to whether Paris or Vienna is the most delectable capital in Europe. Paris is now free, and fortunately has hardly suffered at all from the bombers of either side. Vienna has still to be liberated. Reports have not suggested that the city itself has been bombed to any extent; but factories in the area round about have called for the attention of Allied bombers. They were doubtless built there so as to be out of the easy reach of bombers based in England. The German planners did not reckon with attacks from Italy. The Fortresses of Gen. Spaatz' 15th Air Force have lately been very busy in that area, and have flown there day after day. At the same time Liberators have been hammering the approaches to the Brenner Pass. Kesselring must have it in his mind that sooner or later he will have to get out of Italy. Perhaps he may try to take his remaining troops with him (unless the Führer orders them to die on the spot), and if so the way of escape is not obvious. The problem cannot make for Kesselring's peace of mind.

FOR HOW MUCH LONGER? A reconnaissance photograph of the air-raid damage to Brunswick. For every week the war continues some German city is devastated by Allied aircraft.

Far away in the Philippines, Admiral Halsey has again made good use of the aircraft from his carriers. He sent them on a surprise raid on Manila, the capital city of the islands, where they attacked airfields and shipping in the harbour. Japanese fighters offered resistance, but in vain. It was announced at Pearl Harbour that no fewer than 440 enemy aircraft were destroyed, either in the air or on the ground, and that 30 ships were either sunk or damaged. The Japanese can probably replace the lost aircraft, though it will take time to build 440; but shipping is Japan's weak point, and this was a very heavy blow at her power of maintaining communications with her armies in the occupied territories.

TARNISHING THE LILY: A low-flying aircraft of the 5th U.S.A.A.F. strafes a Japanese Lily medium bomber on the airfield of Selaroe Island.

Mr. Churchill on Bombing

WHEN the Prime Minister spoke on the progress of the war at the Lord Mayor's luncheon he was hardly so happy as he usually is in the words with which he alluded to the bombing of Germany. Starting with the remark that "there now rains down on the guilty German land a hail of fire and explosive of ever-increasing fury," he went on to allude to our own past ordeals, and then assured his hearers that "we have not suffered one-tenth, and we shall not suffer one-tenth, of what is being meted out to those who first started and developed this cruel and merciless form of attack."

Those words sound as if the operations of Bomber Command against German production were a reprisal for the bombing of British cities by the *Luftwaffe*. The Air Ministry has repeatedly asserted that our bomber offensive was not undertaken by way of reprisals. Some who heard or read the Prime Minister's words might be excused if they took it that he was describing the attacks by Bomber Command as "cruel and merciless." Nearly all the *Luftwaffe's* raids on British cities could be so described, for they were obviously attempts to break British *morale* by killing civilians and destroying their houses and other property. The objects of Bomber Command were quite different. They were attacks on German war production. In such attacks it was regrettable but inevitable that German civilians must suffer, especially in cases where sub-contracting plants were scattered throughout the built-up areas of German cities. But most cer-

WAR IN THE AIR

tainly the Royal Air Force never went forth with the deliberate intention of slaying and wounding civilians who were protected by the Geneva Convention and the rules of war; and we are certain that Mr. Churchill never intended to imply that our airmen had so degraded themselves.

"A Curtain-raiser"?

AFTER hard and gallant fighting, the mouths of the Scheldt and the approaches to Antwerp have been cleared of the enemy. It remains to sweep the channels clear of mines and perhaps to do some dredging; but when that work has been completed the Allies will have a first-class port into which they can bring their supplies by ship. Even before the Scheldt was cleared, engineers had been improving the railways up to the front, and supplies had been amassed in preparation for a further advance.

General Patton's 3rd American Army accordingly started a new offensive in the area from Metz to Nancy. Officially it has been described as a "local offensive"; but Sertorius, the military correspondent of the German overseas news agency, has stated that there is hardly a doubt that this offensive is the curtain-raiser to Gen. Eisenhower's' major offensive.

At any rate a very strong force of Fortresses and Liberators was promptly sent out to bomb tactical targets round Metz, and railway marshalling yards in the Saar. The distinction between strategic and tactical bombers is growing thin. The big fellows are now used for both purposes, as the situation demands.

ONE SORT: The rocket has several applications in war. Two on each side of a Seafire's fuselage assist take-off, in this instance from a Fleet Air Arm station in the West Country.

Bombing attacks on railways sometimes send the troops and railwaymen scurrying for cover so earnestly that they do not always come back. Abandoned railway trucks have been found here and there by our men, full of aircraft engines, machine guns, radio sets, aerial cameras, and other items to the value of millions of pounds. Much of the stuff can be used by our own forces.

The approach of winter has handicapped the Allied Air Forces. The heavies, with the help of Pathfinders and special instruments, seem able to continue their work, which now is chiefly the destruction of German oil supplies. During last week-end the British and Americans between them bombed refineries and synthetic plants at Harburg, Dortmund, Castrop Rauxel, and Gelsenkirchen. Night fighting Mosquitoes also ranged over north-west and western Germany and attacked transport targets. One result of the oil offensive was the capture by American troops of five Panther tanks, four of them in good condition but unable to get away for want of petrol.

The Tactical Air Forces were more heavily embarrassed by the weather, in which snow is beginning to become a prominent feature. South-east of Metz the Germans began to pull out, and fighter-bombers went for their columns as often as was possible. Often they could not see the results of their bombing because of the poor visibility. Their operations, however, may have been damaging, and anyway must have been discouraging to the retreating Germans. Retreat is never an exhilarating operation, and snow and general bad weather help to depress the troops taking part in it. When bombing attacks come on top of all the rest, the miseries of the Germans will be multiplied, even if the bombs do not always find their mark.

AND ANOTHER: These, however, fired from a Beaufighter, assisted the final take-off of Germans from their headquarters at Calino, an island in the Dodecanese, during the liberation of Greece.

In the Far East

THE only piece of bad news as we go to press comes from China, where the Japanese have captured Kweilin, the capital of Kwangsi province, and by so doing have denied forward bases to the American Army Air Force. None the less, a large aircraft factory on the main Japanese island of Kyushu has been bombed, as well as targets in Nanking and Shanghai. Moreover, the entire China Sea area has now been brought under Allied air cover from airfields seized in Leyte. One complete convoy with its escort, which was attempting to reach Leyte, was attacked by carrier aircraft and wiped out. It has been announced that the American fast carrier force will be doubled within a few months.

HERE AND THERE

Appointment

AIR VICE-MARSHAL SIR HAZELTON NICHOLL (ret.) has been appointed controller of the R.A.F. Benevolent Fund.

R.A.F. Trains Belgian Erks

GROUND crews for the Belgian Air Force are to be trained in the R.A.F. Technical Training Command in England under the supervision of their own nationals. Active recruiting is reported to be now in progress.

R.Ae.S. Debate

PRESSURE on our space has, unfortunately, prevented us from completing our report of the debate on Civil aviation, the first part of which we gave last week. The concluding talks and discussions will be published in our next issue.

Allison Jets

THE Allison Division of the General Motors Corporation of Indianapolis is to begin production of jet-propulsion units for the U.S.A.A.F. early next year, commitments up to $12,500,000 having been undertaken.

Seventeen test cells have already been installed, and other additions to the Allison plant are to be made.

Very Low Level

THE Merlin engine, it is now disclosed, has been adapted to power the Cromwell tank now fighting in the Battle of Germany on the Western Front.

This version of the famous Rolls-Royce aircraft engine is unsupercharged and develops about 600 b.h.p. It has been named the Meteor, and is the most powerful engine fitted to any British or American tank in production at the present time.

New D.H. Managing Director

MR. W. E. NIXON has been appointed managing director of the de Havilland Aircraft Co. on the relinquishing of that office by Mr. F. T. Hearle on medical advice.

Having closely collaborated with Mr. Hearle since the inception of the company, Mr. Nixon now takes over all the administrative and executive responsibility previously held by Mr. Hearle, who, however, remains an active member of the board and of the subsidiary companies.

Back to Industry

SIR ALAN GORDON-SMITH, who has been with M.A.P. since its formation, is being released from his post as controller of construction and regional services in order to return to his firm, S. Smith and Sons (England), Ltd., but will continue to assist as honorary advisor on regional organisation.

His successor will be Mr. F. J. E. Brake, formerly deputy controller.

SYMBOLIC: This Armstrong Whitworth Ensign (four 900 h.p. Cyclones) of B.O.A.C. flying over the Nile is one of the pre-war British types which has kept our civil air flag flying during the war.

England-India Record

A MOSQUITO piloted by Flt. Lt. James Linton, R.A.F. Transport Command, recently flew from an airfield in the Midlands to Karachi in 14 hr. 37 min. flying time, and an overall time, including stops at El Adem (near Tobruk) and Shaibah (Persian Gulf) of 16 hr. 46 min. Average speed for the total distance was 315 m.p.h.

W/O. Edwin Joseph Goudi, the navigator, said the Mosquito "behaved like a lady," but nevertheless she proved quite a fast young woman!

Indian Tribute to R.A.F.

THREE Japanese guns captured by the 33rd Indian Corps have been presented to an R.A.F. group operating in Burma. The gift is a token of the soldiers' gratitude for the magnificent air support they received throughout the whole of their victorious operations earlier this year.

Adorned with suitably inscribed brass plates, two 47 mm. guns now stand outside the Group mess, and the third, a 105 mm. sample, decorates the purlieus of the mess at Palel airstrip. Gun crews of the R.A.F. Regiment are looking after them.

Out of Control?

MR. MICHAEL DEWAR, chairman of British Timken, Ltd., recently had a few pointed things to say about Government control of industry when he spoke at the company's annual meeting recently.

Saying that "the bureaucrats have not yet found it possible to control industry through one channel," he gave a list of the various ministries, controllers, and departments, which all had fingers in the pie, and quoted an M.P. to the effect that not only did the right hand not know what the left hand was doing, but the fingers of the same hand didn't even know.

Many were regarding planning and "control" as the only hope for the future, he added, but those in industry with experience of it could only pray for a rapid return of the day when it would be possible to make a decision "without having to consult endless committees of people whose experience of industry is so limited as to be almost negligible."

"Squirts"

THE other day we received a note from Power Jets, Ltd., commenting upon the fact that the word "Gyrone" is being wrongly used to describe jet-propulsion units in general, and pointing out that the name is their registered trade mark and applies to their products only.

Our incorrigible rhymster managed to get hold of this letter and has perpetrated the following:—

There are Power Jets called "Gyrone"
And a "movie" Power called Tyrone
(We only dragged his name in 'cos it rhymes),
But the former, we're advised,
Has been specially devised
For one proprietary product of the times.

There are journals, so it seems,
Who, on jets, have published reams
And used The Name so loosely that it hurts,
But we love our English tongue
Far too well to do it wrong,
So we very much prefer to call them "Squirts."

Praise for the Sunderland

THE Commander-in-Chief of the Nore, Admiral Sir John Tove, paid a warm tribute to the work of the Short Sunderlands recently. The occasion was a performance of "Peg O' My Heart" by the Amateur Dramatic Society of Short Brothers, which enabled them to hand over a cheque for £250 to the Royal Naval Benevolent Fund.

In accepting the cheque, Sir John gave as an instance the case of an engagement

HERE AND THERE

during which the Navy was troubled by an Italian aircraft. A signal was sent to a nearby Sunderland, whose reply was: "I'm no Spitfire, but just you watch me." A few moments later the Italian went down in flames.

Torchbearer

AN assurance that it was the policy of the British Government always to use British-built aircraft for important official journeys to other countries whenever possible was given by the Air Minister (Sir Archibald Sinclair) in the House the other day.

He told Sir Oliver Simmonds that Mr. Churchill used an Avro York manned by a British crew for his recent Moscow trip.

Post-war Research

SIR STAFFORD CRIPPS, Minister of Aircraft Production, stated in the Commons recently that a number of concrete plans had already been considered with regard to post-war research organisation in various branches of aeronautical research.

The complete scheme, he added, had not yet been finally settled. There was already an Aeronautical Research Committee, and the future composition and terms of reference of this body, which had made a most valuable contribution in research matters, was now under consideration.

Allied Invaders

THE latest in American attack bombers, the Douglas A-26, is reported to be faster than any other in its class and to have an "all-purpose nose" to facilitate quick changes of armament according to the job in hand.

The name "Invader" has apparently been selected for the A-26, which is going to be a bit confusing, as this same name was long ago bestowed by the R.A.F. on the dive-bomber version of the Mustang, designated A-36 in the U.S.A.A.F.

£12,000 for French Children

A CHEQUE for £12,765 subscribed by the men and women of Bomber Command for French children has been given by Air Chief Marshal Sir Arthur Harris to M. Rene Massigli, the French Ambassador.

The money is to meet the needs of children whose parents or guardians have been shot for having hidden British bomber crews and for other children who have suffered directly or indirectly from the effects of British bombing.

M. Massigli's acknowledgment says that the "gesture will go to the heart of the French people."

REMOTE CONTROL: The comparative blindness of the modern single-engined fighter when taxying is well known. This U.S.A.A.F. pilot overcomes the difficulty with a little outside help on the wing of his Mustang.

Albert Hall Tribute to U.S.

A THANKSGIVING DAY celebration is to be held at the Albert Hall on November 23rd as a tribute to the United States.

Sponsored by *The Daily Telegraph*, which is defraying all expenses, it will take the form of an experiment in prose, verse, and music under the title of "To You, America," and is to be produced by Sqn. Ldr. Ralph Reader.

The London Symphony Orchestra, the Alexandra Choir, the Kneller Hall Trumpeters, and many well known actors and actresses are taking part. The script has been prepared by Mr. Steven Potter, and the musical side is in charge of Mr. John Barbirolli.

Tickets range from 3s. 6d. to £3 3s., and the whole of the proceeds will go to King George's Fund for Sailors.

"Rex" Raiders Decorated

FOUR pilots from the rocket-firing Beaufighter squadron of Mediterranean Allied Coastal Air Force, which made the initial attack on the 51,000-ton Italian liner *Rex* in the Adriatic have received immediate awards, the Air Ministry announced last week.

Sqn. Ldr. Roderick Harry Rose, of Ashford, Kent, who led the attack, has been awarded the D.S.O., and Flt. Lt. Chester Franklin Rideout, R.C.A.F., of British Columbia, F/O. Eric Gordon Myring, of Shincliffe, Co. Durham, and F/O. David Austin Lampard, of Knockholt, Kent, have been given the D.F.C.

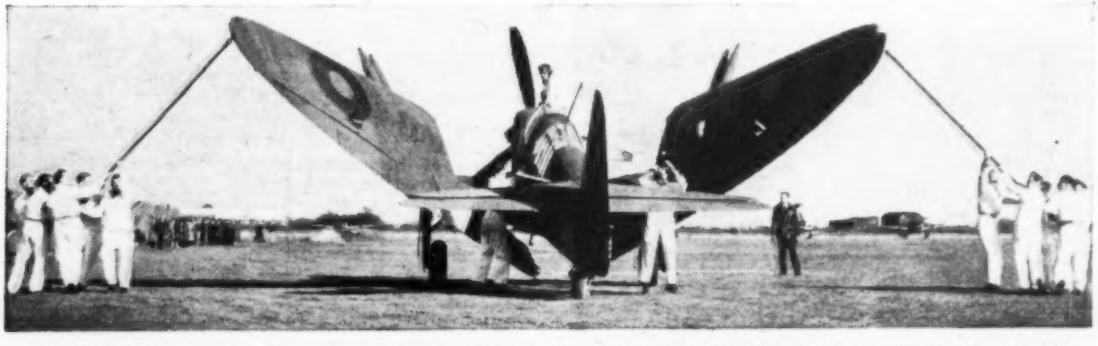
Pan American Move

ACCORDING to reports circulating in authoritative quarters in the U.S., Pan American Airways are at present planning to transfer the ownership and control of their airlines in Mexico and Brazil to national companies of those countries.

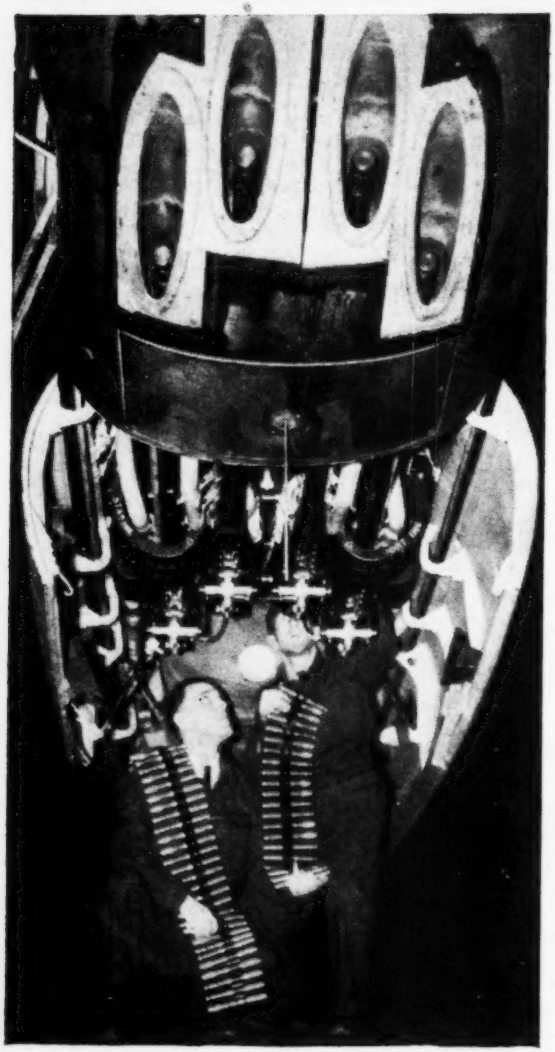
This is understood to correspond with the trend of farsighted business circles who accept the principle that nationals of one country should not dominate the essential airlines of another.

The view of the U.S. Government, says Reuter's special correspondent, was stated by Mr. Adolf Berle, head of the U.S. delegation at the beginning of the Chicago conference, when he said that each country should, so far as possible, come to control and direct its own internal airlines.

It is reported that after January 1st Pan American Airways will no longer carry local traffic in Brazil.



UNWRAPPED: Recently released from the cloak of official secrecy, a Fairey Firefly unfolds its wings to fly with the Fleet Air Arm. The type was described and illustrated in last week's issue of *Flight*.



Bomber Support

Interceptors Intercepted : Reasons for Big Drop in Bomber Command Casualties

By JOHN YOXALL

TO appreciate the present air picture it is necessary to cast one's mind back to the winter of 1940-41, when Beaufighters searched the night sky of Britain for "trade" in the form of German bombers. Other aircraft—mostly Havocs—went on the then new intruder patrols over enemy air bases on the Continent, to bomb runways, shoot-up aircraft landing or taking off and generally make themselves a nuisance.

This intruder flying still goes on, but instead of shallow penetrafions into France, Holland and Belgium, the Mosquitoes of Bomber Support Group now range by day and night over the whole of Germany and the occupied countries. The enemy has no "safe" area in which to carry out training, neither does any *Luftwaffe* pilot ever know for certain that he will not be attacked just as he is about to land or take off. Even if no actual attack is made, it is very disconcerting to have the airfield lights switched off just as it is approached. The Germans, of course, put out decoy lights, but the quality of the Mosquito navigators is such that they are seldom fooled.

(Top) LAST LIGHT: A Bomber Support Mosquito runs up its Merlins before take-off.

(Left) THE WORKS; The four 20 mm. Hispano cannon in the bomb bay of a Mosquito.

(Right) IN THE SOUP: The very unofficial crest of a Bomber Support Group.

The important new feature of Bomber Support Group—the feature which has been largely responsible for the recent big drop in bomber losses—is the fogging of the enemy system of defence signals and the shooting-down of enemy night fighters before they are able to attack our heavy bombers. This last is in the best traditions of the Royal Air Force. *The attack must be made before, not after, the target is reached.*

Last winter the German night-fighter force, though it never achieved, or got near achieving, its principal aim, changed its tactics and succeeded in inflicting heavier casualties on our Lancasters and Halifaxes. On February 20th, 1944, we lost 70 bombers in an attack on Leipzig; on March 23rd we lost 73 on Berlin; and on March 31st 96 on Nuremberg. The average percentage of Bomber Command's losses was far lower than on these three nights, and on the night of February 16th a thousand bombers attacked Berlin at about the same cost as the thousand-bomber attack on Cologne two years before.

This was an achievement which showed that if the enemy's night-fighter force had increased in strength and efficiency, Bomber Command's tactics had improved at least to the same extent. But it was also clear that if the enemy night-fighter force could further improve its tactics then Bomber Command was up against a serious drain on its resources. Our attacks were putting so intolerable a strain on the enemy, and the damage was spreading so rapidly in the larger industrial towns, that the German night-fighter force had to be given every priority in the supply of men, instruments and machines.

The enemy were able to shoot down such comparatively large numbers of aircraft on these few nights because they had at last hit on an idea which seems comparatively obvious, but which required improved instruments and an intricate organisation. During 1943 it had been the regular practice for the enemy to attempt to intercept our bombers while over the target, but towards the end of that year it was decided that the fighters should attempt to get into the bomber stream and fly with it. The bombers could then be picked off one after the other.

"AND THEN WE . . . ." F/O. Henri Cabolet (left) and Flt. Lt. R. V. Smith being interrogated by Section Officer Jene Barclay after returning from a bomber escort job over Germany.

Over the target the fighters only had about half an hour in which to make their interceptions, and during this critical time they were often led astray, but if they got into the bomber stream they might have four or five hours in which to make a succession of attacks. These tactics were, of course, particularly suited to the winter and the long nights, when Bomber Command would be penetrating deep into Germany to attack targets 600 miles and more from base.

For a while the Germans may have reflected with some complacency on their night-fighter successes, but they must also have been seriously troubled by a new development. The night fighters themselves began to disappear mysteriously in the darkness. Our bombers give a good account of themselves despite the employment of only small-calibre machine-guns, but for this latter reason it is not to be expected that enemy night-fighter casualties would be high. When their casualty rate began to go up, the enemy must have been greatly perplexed. There is reason to believe that for some time he had no idea what was happening, and naturally nothing was said to enlighten him.

The Chaser Chased

Whatever Bomber Command had done was a closely guarded secret, and even in the R.A.F. there were many who did not connect the formation of a new Bomber Group (it began to operate at almost exactly the same time as the bomber stream) with anything beyond the ordinary process of bombing. Inevitably, the enemy found out what was happening in the end; a night-fighter pilot got back to report that while he was chasing a four-engined bomber, a very fast and well-armed Mosquito had chased him. The Germans took up their new tactics of intercepting the Mosquito force, which was sent out with the bomber stream, flying beside, above, or below it, began in a small way and had to learn from experience. But there is no doubt that its use has proved enormously worth while.

Since January, Mosquitoes of this Group have shot down more than 130 night fighters for certain, and there is every reason to believe that the actual number destroyed is far greater. It is always difficult to make sure in darkness and over enemy territory whether an aircraft known to have been damaged—and the Mosquitoes have intercepted and damaged a very large number of fighters—has been destroyed.

The deterrent effect of the Mosquitoes' support for the

(*Continued at foot of next page.*)

ALL IN THE DAY'S WORK: P/O. Groves, D.F.C., and Flt. Sgt. Dockery, D.F.M., who, in company with another Mosquito, destroyed 9 enemy aircraft during a daylight intrusion over Germany.

Developments in Coastal Command

From Defensive to Offensive Policy

AN outline of the war history of Coastal Command was given to the Royal United Service Institution by Air Vice-Marshal A. B. Elwood, C.B., D.S.C., on November 8th.

The lecturer said that he had only time to touch on salient points of his subject, and could only spare a few words for such units as the Photographic Reconnaissance, Meteorology, and the Air-Sea Rescue Service, all of which worked for the whole Air Force, but were administered by Coastal Command. He selected as his main subjects the anti-U-boat campaign and the anti-shipping operations.

At the beginning of the war, said the Air Vice-Marshal, we had no clear idea about the difference between defensive and offensive policy; so we stuck to defence and kept our aircraft close to the convoys. At the end of 1940 it had to be admitted that the air had made little or no contribution to the defeat of the U-boat.

In May, 1941, there were two notable advances, one in the types used and the other in the method of using aircraft. The chief bases of the U-boats were on the Bay of Biscay, and we began to attack the boats on their way out to their hunting grounds. When submerged the U-boat can only travel at three or four knots, and it must come to the surface at intervals to charge batteries and ventilate the vessel. Therefore, to keep them submerged all day handicapped them severely.

To cover all the area called for many aircraft; so the escort machines were reduced to a minimum and all the rest were sent hunting. This produced results. Kills were still rare, but sightings became more frequent, and the boats were kept submerged. Gradually we drove them farther away from our bases. In the Bay they remained submerged all day. During the latter part of 1941 they operated mainly in the Caribbean Sea, where prizes were numerous; and the Americans had not yet got into their stride.

In May, 1942, the introduction of the aircraft searchlight produced great results. The U-boats found that when suddenly illuminated they had not time to submerge before the attack developed. So they took to surfacing by day, with the result that there were more sightings. Our offensive in the Bay grew in strength. The landings took place in N.W. Africa, and the interference by U-boats was negligible.

The year 1943 was a disastrous one for the German submarines. In the early months there was still the "gap" of 600 miles in the middle of the Atlantic, and the rate of building new merchant ships had not yet caught up the rate of sinkings. At the Casablanca Conference the defeat of the U-boat was given first priority by the combined Chiefs of Staff. From January to May that year the mass attacks on convoys were in full swing. In March we established a base in Iceland for long-range Liberators, and the Royal Canadian Air Force set up another in Newfoundland. Escort carriers appeared, and went a long way to bridge "the gap."

Between May and August of 1943 the Germans mounted A.A. guns on the U-boats, and the boats stayed on the surface and fought it out with the aircraft. This proved very expensive to them and resulted in heavy losses, as many as 30 boats a month.

The third phase lasted from then up till D-Day. The Germans again changed their tactics, and only surfaced by night. The *Luftwaffe* sent fighters out into the Bay of Biscay to shoot down our Coastal aircraft. There were two special bursts of activity in October, consisting of two mass attacks by the same pack of boats. They were roughly handled. Then the permission granted by Portugal for us to use the Azores greatly eased our difficulties. Lately we have developed the close co-operation of aircraft and surface hunters. That has proved the best method of killing the U-boats.

Before D-Day the diminution of attacks in many usual areas told our authorities that the U-boats were massing to attack our invasion fleet. But the approaches are not wide, and we were able to bar them.

Now, having lost the Biscay coast, the Germans are working from Norway. It is much less convenient, but, said the lecturer, "the U-boat is very much alive."

The Anti-shipping Campaign

In our campaign to destroy enemy shipping Coastal Command, said the Air Vice-Marshal, has two main types of aircraft, the Beaufighter and the Mosquito, and two main weapons, the torpedo and the rocket. The torpedo is much the more deadly of the two, and is the only weapon with which aircraft could hope to destroy a capital ship. Damage below the water line is much more dangerous than anything a bomb through the deck can do. But the torpedo has disadvantages, such as inability to work in shallow water.

Coastal Command's early operations against shipping took the form of low-level attacks. To meet them the Germans used escort ships, which put a stop to that form of attack. Our next move was to use cannon against the *flak* ships. Also we sent out larger forces, up to 50 machines, of which the majority were meant to attack the *flak* ships. There might also be a top cover of fighters, bringing the total of aircraft up to about 70.

This method has been so successful that now the Germans mostly sail by night.

The lecturer ended with a tribute to the courage and skill of the aircrews and to the work of the maintenance men.

BOMBER SUPPORT

(*Continued from previous page.*)

bomber stream has proved as important as the casualties they inflict on the enemy. Throughout this year the enemy fighter pilot has never known whether he will suddenly become the hunted instead of the hunter. German night fighters are not particularly fast, and there is no need for them to be if their only task is to intercept four-engined bombers, but the Mosquitoes which attack them are among the fastest and most manœuvrable aircraft in the world.

Other Mosquitoes go from the Group to the points where the night-fighter pack may be expected to assemble and catch the enemy there. In fact, by all these forms of intruding, as well as by accompanying the bomber stream, the Mosquitoes give the bombers both high and low-level support. They also operate on nights when there are no bombers over Germany, constantly harassing the night-fighter force at times when it would otherwise have a chance to recuperate and rest.

Another equally important task of the Group is to disorganise the enemy's defence system of signals, early warning, and communications, by various means. Dropping strips of metal foil and in other ways exploiting the weakness of radiolocation is used by the tacticians of Bomber Command to present a false picture to the enemy.

The night war in the air of 1944 is fought at speeds of well over 400ft. per sec. If only a short delay, or even a moment's indecision, can be forced on the enemy, then the difficulties of interception, which are always acute, are quickly doubled. It only needs an enemy commander to take his eye off the ball (we provide the distractions) for a few minutes, and another German city is smashed for the loss of perhaps one per cent. of the attacking bomber force.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Postponed

THE recruiting rallies (*Erfassungsappelle*) for the *Volkssturm* in the Hanover district, which were to take place on October 29th, had to be postponed because of difficulties created by Allied air raids.

Dummy Fighters

LUFTWAFFE leaders have thought out a new trick to try to fool Allied pilots.

Dummy fighters with German markings are sent into the air and exploded, with the idea of upsetting and confusing R.A.F. men—but the trick does not seem to work.

Secret Research?

THE Norwegian *Vestmanlands Lans Tidning* reports that German technicians have been busy experimenting for several months in a high mountain hotel on new inventions for the *Wehrmacht*, and the most varied rumours are circulating about the character of these experiments. The hotel is isolated, and strong German guards keep people away from the experimental station. Even high ranking officers must have passes to be admitted.

"These reports," says the paper, "may perhaps be seen against the background of London reports that flying bombs have been sent from Norway. It is, however, obvious that the Germans are engaged on important experiments on Hardangervidda, which for several months has been hermetically closed to the outside world. During the last month a strict curfew was imposed and no one was allowed to leave the closed area, while people residing inside the closed area are not allowed to be out of doors after dark."

From the *Luftwaffe*

MAJOR WALTER NOWOTNY, Group Commander and holder of the highest German distinction for valour, was killed in a combat during the Allied raid on Hanover.

The German *Luftwaffe* loses in him one of its most successful fighter pilots, who was credited with as many as 258 aerial victories.

Traffic Dislocation

TRAVELLERS from southern Germany tell of unusually long delays in railway traffic caused by air attacks. Express trains frequently have to stop for several hours in the middle of the line or are unable to go on because the tracks have been destroyed. Notices reading "Drive slowly" have been put up everywhere to warn engine drivers of the danger of air attacks. Since the beginning of the week traffic to Stuttgart has been completely suspended, and the whole of the rail traffic from central Germany to Switzerland now runs *via* Augsburg and Ulm.

Journeys which normally take a few hours now often take several days because passengers frequently have to get off between stations and continue for several kilometres on foot to catch the next train. Passenger traffic operates mainly in the day, while goods traffic is confined almost exclusively to the night because darkness is to a certain degree a protection against attacks from the air.

MANNA; A Ju 188 in which a German-Jewish mechanic made his 400 miles exodus from Germany when ordered to report at a forced labour camp. The aircraft is powered with two liquid-cooled inline Junkers Jumo's and has a redesigned dorsal turret with a 20 m.m. machine gun.

V2

"WELL-INFORMED Berlin quarters," says the German Overseas News Agency, gave this comment on V2:—

"Berlin is extremely confident, and believes that a great step forward has been made which will result in England and other distant targets being bombed to an 'increasing degree.'

"Long-range warfare has entered a new phase.

"The knowledge and experience gained by German technicians from the flying bomb have been of the greatest importance for the construction of V2, but competent German quarters are not inclined to make any concrete statements on its technical details. . . ."

Neutral Rumour

A SWEDISH paper professes to know that the Germans have concentrated in Western Jutland 10,000 "robot aircraft" of a new type.

Weighing ten tons and flying at 750 m.p.h. the report says that the giant doodle bug flies at an altitude of 60,000ft., is immune to fighters or flak and has enough range to reach New York.

To round off the picture the radius of destruction of the new weapon is given as 3 miles.

A usually reliable Swedish aeronautical commentator confirms the existence of German rocket projectiles, but considers the above report as exaggerated in details of performance.

The Swedish expert believes that both the range and the explosive power are smaller than stated above. The range he estimates, for instance, to be sufficient to reach this country from Jutland.

Air Exodus

SPECIALISED German soldiers and highly trained officers are being evacuated by air from the besieged Atlantic ports in which the enemy is still holding out, reports Reuter's special correspondent from Paris.

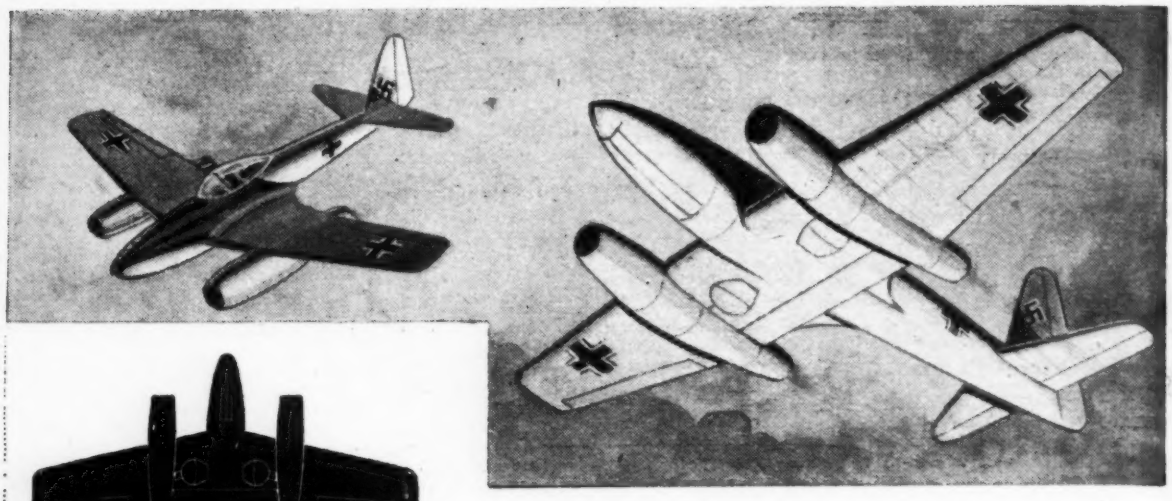
These ports are Dunkirk, Lorient, St. Nazaire, La Rochelle and Royan, a small place at the mouth of the River Gironde.

These Germans are being flown back to Germany by the *Lufthansa* and are then frequently sent to strengthen Germany's Western front. An increase in these escape movements has recently been observed by the sadly under-equipped F.F.I. units which are manning the front lines outside these German strongholds, and French reconnaissance aircraft have recently been sent to assist them.

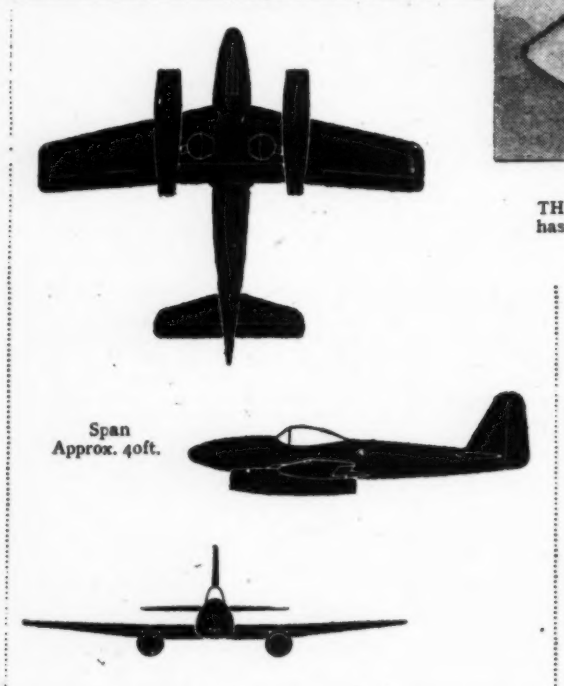
At Stalingrad the Germans similarly used aircraft to bring out all their best officers from the Red Army's iron ring around the city. They left in command a handful of extremely tough men of daredevil type, who were indifferent as to how many of the number were sacrificed in an effort to obey Hitler's orders to hold out.

The men who are being taken out of the Atlantic ports include radio operators, experienced gunners, pilots and sailors.

German Jet Fighe



THE MESSERSCHMITT Me 262 jet-propelled single-seater fighter has two wing-mounted Junkers axial-flow units, and is a clean design, with very slim fuselage.



FROM the moment when the Air Ministry released the first news that Britain was producing fighter aircraft propelled by jet reaction, as a result of the successful development of this type of power unit by Group Capt. (as he then was) Frank Whittle, practically the whole of the newspaper publicity given to the subject has dealt, quite naturally, with its progress in Britain and America. One result of this, however, has been that the general public gained the impression that jet propulsion was an exclusively British invention which had put the Allies a very big technical jump ahead of the enemy.

It must have come as something of a shock at many a British and American breakfast table, therefore, when news of German jet-propelled fighters in action on the Western front was first mentioned some little time ago. Readers of *Flight*, however, and particularly those familiar with "Gas Turbines and Jet Propulsion for Aircraft" by *Flight's* managing editor, Mr. G. Geoffrey Smith, will have been aware that German engineers and scientists had also been at work on the same project, and that there was no reason to suppose that they were appreciably behind Britain in solving the problems presented by its practical application to aircraft.

Three different types of German "jet fighter" made their appearance during the past summer. Two of them were among the comparatively few aircraft which the *Luftwaffe* was sending up against the R.A.F. and the U.S.A.A.F., and it was an American pilot whose report of having encountered some of them was first released for publication. Actually there were several German jet-propelled prototypes flying as long ago as 1942, and it is now believed that the famous German "ace" of the 1914-18 war, Ernst Udet, was test-flying a "squirt job" when he met his death in 1941. The designs for these German jet-propelled fighters were actually on the drawing board before the outbreak of the present war in 1939.

Messerschmitt and Heinkel

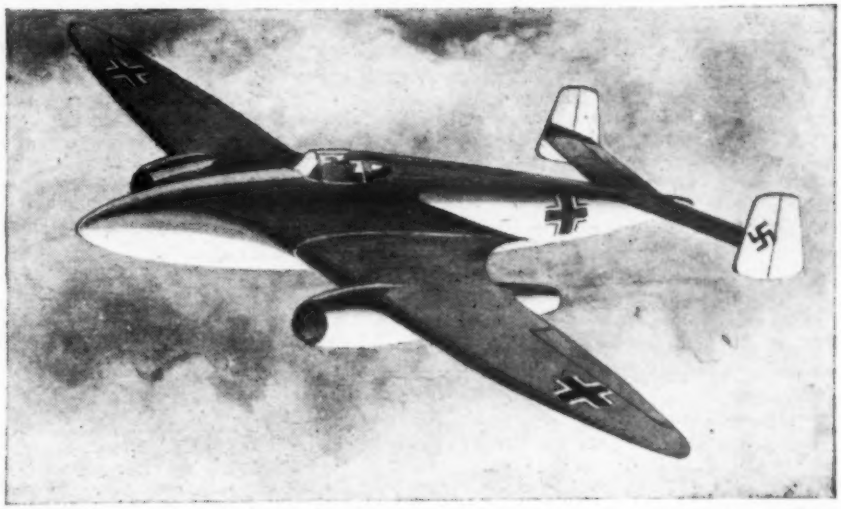
The three types of German jet fighter already referred to are the Messerschmitt Me 163 and Me 262, and the Heinkel He 280. Other German concerns are also reported to be busy on development work. It should not be forgotten, incidentally, that the very first practical application of the principle of jet propulsion in aerial warfare was the flying bomb, whose official designation is FZG-76, and to which German propaganda refers as V.1. On this side of the English Channel we have less polite names for it!

But the flying bomb (frequently referred to in yet another place by the laborious title of "explosive-carrying, reaction-propelled, crewless aeroplane") is in quite a different category from the jet fighter. Its power unit represents the very crudest possible method of providing propulsion by jet reaction and, though undeniably clever in its stark simplicity, it is chronically inefficient and, *per se*, terribly wasteful of fuel.

The two Messerschmitt jet fighters also differ substantially from each other. The Me 262, like the He 280, employs the same general principle as our own Whittle unit and it burns some normal form of liquid fuel with oxygen from the air. The Me 163, on the other hand, employs a special liquid chemical fuel containing its own oxygen for combustion and may therefore be more conveniently described

ghers in Operation

Me 163 Rocket, and Me 262 Axial-flow Turbo Units : Novel Pilot-ejector Emergency Device



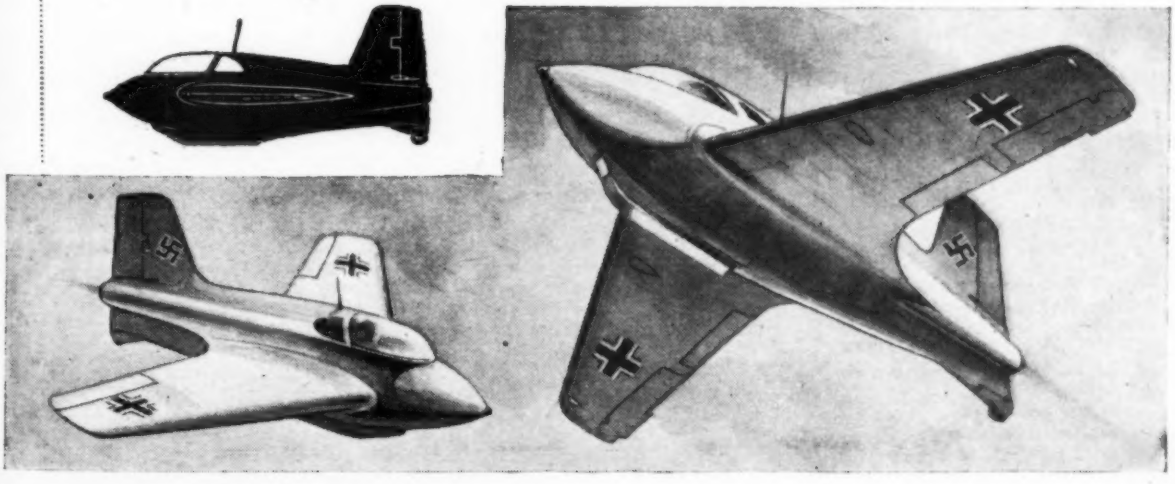
THE HEINKEL He 280 differs from the Me 262, mainly in having twin fins and rudders and cockpit cover faired into the rear fuselage. It is not quite so fast as the Me and far fewer of this type have been built. The wing form is typically Heinkel.

as rocket-propelled. In both cases, of course, the purely physical principle of thrust by reaction from the efflux, or jet, is precisely the same.

Constructionally the two Messerschmitts differ chiefly in that the Me 262 jet-fighter has two power units, one under each wing, and its airframe includes the normal tail surfaces, whereas the Me 163 rocket jet-fighter employs a single power unit in the rear of the fuselage and, while retaining a single fin and rudder, has no horizontal tail surfaces. Control in the pitching plane is taken care of by differential ailerons on sharply backswept wings. This aircraft is being produced in two versions, for in addition to the operational fighter, designated 163B, there is a trainer edition, the 163A.

As our illustrations show, both Me 262 and Me 163 are very "clean" aircraft, particularly the latter, whose top

DESIGNED FOR HOME DEFENCE INTERCEPTION, the Me 163 has a single rocket unit giving phenomenal performance but exceedingly short duration. With no tailplane, it approaches the flying-wing ideal. Undercarriage is dropped after take-off. Operational and trainer versions are produced



GERMAN JET FIGHTERS IN OPERATION

speed is said to be well over 500 m.p.h., and whose climb is described as really terrific. Its range, however, is extremely short, and its function is solely that of home defence interceptor. Actual duration is said to be no more than ten minutes, though its time in the air can be extended a little by gliding periods. To save weight the main undercarriage is dropped after take-off and the aircraft lands on a central skid under the fuselage, and its tailwheel.

The Me 262 (more of which are now coming into service) with its two axial-flow turbo-jet units of Junkers manufacture, has a more useful range and duration, but its performance is not quite so meteoric; even so it is credited with about 500 m.p.h., and is armed with up to four cannon mounted in the nose. More recently bombs have also been carried under the wings, which have slotted flaps between the roots and the jet nacelles. A tricycle undercarriage is fitted and a novel feature is a device by which the teardrop cockpit cover, seat, pilot and his parachute can all be catapulted clear of the aircraft in an emergency—bailing-out has been reduced to pressing a button.

Finally, the He 280 is very similar to the Me 262, but has not been encountered in action as yet. Its jet units, though outwardly similar, are of different make and design, and it has twin fins and rudders on a tailplane with dihedral angle. Its elliptical wings with pointed tips have advantages over the angular backswept wings of the Me 262, but otherwise the Heinkel is not quite so clean aerodynamically and is probably a little slower. A tricycle undercarriage and the same pilot-ejector device are employed, and its span is reported to be a little less than that of the Me 262.

The Chicago Conference

More Than 50 States Represented : Agenda of Meeting

THE invitations to the International Civil Aviation Conference now being held in Chicago sent out by the U.S. Government were extended not only to all members of the United Nations but also to Nations associated with them in this war, and to European and Asiatic neutral nations. An official announcement explained that the participation of the latter is desired "in view of their close relationship to the expansion of air transport which may be expected along with the liberation of Europe."

Apart from Great Britain, Russia and China, the following Governments and authorities were invited to participate:—Twenty Latin-American states: Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Philippines, Uruguay, Venezuela; the Dominion Governments of Australia, Canada, New Zealand, South Africa and the Government of India; eleven belligerent European States: Belgium, Czechoslovakia, France, Greece, Northern Ireland, Luxemburg, Netherlands, Norway, Poland and Yugoslavia; the five neutrals: Eire, Portugal, Spain, Sweden, Switzerland, and finally Afghanistan, Egypt, Ethiopia, Iran, Lebanon, Liberia, Saudi-Arabia and Syria.

Business Agenda

The U.S. Department of State proposed the following agenda for the Conference:—

Arrangements covering transitional period: establishment of air transport services on a provisional basis.

1. Arrangements for routes and services to operate during a transitional period.

2. Drafting of agreements to implement the provisional route pattern and to guide operations during transitional period.

(a) Landing and transit rights to permit establishment of provisional air services as soon as possible. (b) Right of technical or non-traffic stop. (c) Application of cabotage. (d) Use of public airports and facilities, on a non-discriminatory basis. (e) Frequency of operations. (f) Bona fide nationality of air carriers. (g) Control of rates and competitive practices.

3. Arrangements for the selection of continuing committee on air transport to serve during the transitional period.

Technical Standards and Procedures:—

1. Recommendations for setting up and adopting standards and procedures in the following fields:—

(a) Communications systems and air navigation aids, including ground markings. (b) Rules of the air and traffic control practices. (c) Standards governing the licensing of operating and mechanical personnel. (d) Airworthiness of aircraft. (e) Registration and identification of aircraft. (f) Collection and exchange of meteorological information. (g) Log books and manifests. (h) Maps. (i) Airports. (j) Customs procedure.

2. Arrangements for and selection of a technical committee and sub-committees to serve during transitional period, and to draft definite proposals for submission to the interested governments.

Multilateral Aviation Convention and International Aeronautical Body.

1. Formulation of principles to be followed in:

(a) Drawing up a new multilateral convention on air navigation and related subjects. (b) Establishing such permanent international aeronautical body as may be agreed on, and determining the extent of its jurisdiction.

2. Arrangement for the selection of a committee on multilateral convention and international body to serve during transitional period and to draw up definite proposals for submission to the interested governments.

Consideration of establishment of an interim council to serve during a transitional period which might supervise the work of other committees functioning during this period; and performing such other functions as the conference may determine.

1. Recommendations concerning locale, composition, and scope of interim council.

2. Length of transitional period, mechanism for converting recommendations of interim council and its committees into permanent arrangements, and other arrangements covering the transitional period.

Committee on Technical Standards

While the sudden withdrawal of Russia's participation weakens in advance any formulation of a future framework, an exchange of views of representatives of some 49 Governments—even if it leads to nothing else but the laying down of technical co-operation may be, in itself, a step in the right direction.

A plenary committee on technical standards was organised on November 3rd. The unit, one of the four basic committees of the conference, convened under the chairmanship of Mr. M. L. P. Steenberghe, chief of the Netherlands Economic, Financial and Shipping Mission and chairman of the Netherlands delegation to the conference. The committee's vice-chairman is Mr. A. D. McLean, technical adviser to the Canadian delegation.

Formally known as committee two, the unit established these sub-committees:

(1) Communications procedures and airways systems. (2) Rules of the air, air traffic control practices. (3) Standards governing licensing of operating and mechanical personnel. (4) Airworthiness requirements for civil aircraft engaging in international air navigation. (5) Aircraft regis-

THE CHICAGO CONFERENCE

tration and identification. (6) Collection and dissemination of meteorological information. (7) Aeronautical charts. (8) Customs procedures and manifests. (9) Accident investigation, including salvage and search for missing aircraft. (10) Standardisation of printed forms. Officers of the sub-committees will not be selected until their membership has been determined from nominations submitted by the various delegations.

The position taken up by the U.S. Government was set forth by Mr. Adolf A. Berle, U.S. Assistant Secretary of State and chairman of the U.S. delegation. The statement was a lengthy one but, briefly, the main points of it were: The U.S. Government believes in and asserts the rule that each country has a right to maintain sovereignty of the air over its lands and its territorial waters. There is a similarity between shipping and air transport, and we are at a stage in air transport when there should be developed established and settled customs of friendly permission between friendly nations, and that in exchanges no exclusion or discrimination shall exist.

On the subject of an international authority Mr. Berle said all were agreed that an effective form of world organisation is necessary. The problems fell into two categories, the commercial and economic, and the technical. Among the latter there were few which were not susceptible of ready solution through the counsel of experts. In the economic and commercial field the problems were much more complicated, and no one had yet stated on what basis routes should be allocated or even what was "equitable" in these matters. The U.S. Government believed that, at present, international organisation in the economic and political fields must be primarily consultative, fact-gathering and fact-finding, with power to bring together the interested states when friction develops, and designed to set up a system of periodic conferences. America also reserved the right to develop its internal traffic (known as cabotage).

Mr. Berle concluded with an assurance that the U.S. Government will make available, on non-discriminatory terms, civil air transport machines when they can be released from military work, to those countries which recognise the right of friendly intercourse.

Dr. Chang, head of the Chinese delegation, said his country agreed with the U.S. on the question of an international authority. Thus the British view now stands still less chance of being accepted.

Airworthiness

The Air Registration Board and the Dominions

"I AM not suggesting that we do good by stealth, nor that we have reason to blush for our fame, but our functions, and even our existence, are not widely known, and if that be true in this country how much more so in the Dominions."

In those words Sir Maurice summed up the reasons for the lunch given in London on November 9th to representatives of the Civil Airworthiness Authorities of the Dominion Governments. He recalled that the success of regulation of design, construction and survey of ships embodied in the activities of the two Shipping Registers was the primary factor in influencing the Government to establish the Air Registration Board for aircraft. This was the first example of the principle that the industry should govern itself.

Sir Maurice explained the constitution and functions of the A.R.B. as follows:—

"The Council of the Board consists of four representatives from each of the operating, insurance and constructing interests, leavened, if I may use the term, by the same number of independent persons, presumably to see fair play amongst the others. There are in addition two representatives nominated by the Secretary of State for Air, but—and this I wish to make clear—they do not speak for the Minister. One represents the interest of commercial pilots, and the other those of 'the man in the street.'

"The Board has no executive authority. It works entirely by recommendation directly to the Secretary of State for Air. It is, by its constitution, a democratic body in the fullest sense because each of its twelve primary members is nominated by the vote of the members of the interest he represents.

"I believe myself that the constitution of the Board is such that it can more flexibly administer the technical matters delegated to it than could a Government Department.

"We have no politics and only one policy: to ensure airworthiness, and to foster the greatest measure of self reliance in all concerned in the design, construction, operation and upkeep of civil aircraft.

"When the Board was formed in 1937 the Government delegated to it the responsibility only for the design approval of the smaller class of public transport aircraft of under 10,000 lb. maximum loaded weight. We thought that this was an unsatisfactory state of affairs which would result in an undesirable devision of responsibility between the Department and the Board, and, furthermore, that the restriction in our activities which this partial delegation meant, could only be a temporary one if our proper functions were to be fulfilled.

"I am glad to say that both the present Director General of Civil Aviation, Mr. W. P. Hildred, and his predecessor, Sir Francis Shelmerdine, who is now a welcome member of the Board, agreed with us, and the Board in due course was given full responsibility for the approval of the design of all civil aircraft irrespective of size.

"We have always realised that this carried with it the duty of preparing and publishing a complete code of airworthiness, and it is to this task that we have now put our hands. We have two principal objects in mind—the first is the production of requirements for British aircraft which will result in the highest possible standard of safety compatible with reasonable commercial operation, and such a measure of freedom for the aircraft constructor as will encourage him in competitive world markets.

"It is also, however, our duty, although a secondary one, to ensure that as far as is consistent with our primary object our requirements should be so framed as to fit into the general pattern of the airworthiness requirements of other countries to which we may fly and whose aircraft may fly to this country.

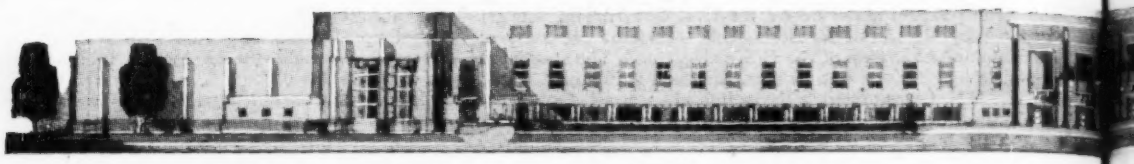
"Before the war Britain and the Dominions subscribed to the International Convention for Aerial Navigation, and as most of the European countries were also parties to this, the machinery existed, and, in fact, does still exist, by means of which each party could accept a common standard of airworthiness. This Convention had the somewhat serious defect that Russia and America and the countries of the Western Hemisphere were not parties to it, and we hope that this defect may be removed.

"It is not the business of the Board to redesign the machinery, but we believe that a mutually acceptable code of airworthiness would form one of the principal foundations on which it could be built. The United States of America shares this belief with us, and for some time now we have carried on unofficial discussions with our good friend, Dr. Edward P. Warner. As our requirements develop and as American requirements are revised, we may gradually remove such differences as exist, and reach a stage at which we could agree that aircraft designed and constructed in either country would be acceptable to the other.

"We feel that, in matters of airworthiness, as in so many greater things, the Empire is indivisible, and we have therefore suggested to our friends in the Dominions (and they, I am glad to say, fully agree with us) that at least in technical matters we should speak with one voice. I feel that, anxious as Britain may be for a complete international agreement, we should also strive to foster the development of aviation as a bond between the Dominions and ourselves, and that a mutually agreed code of airworthiness, if but small, is an essential link in the chain."

Australia, New Zealand, Canada, India, South Africa and Southern Rhodesia were represented.

A COLLEGE of AERONAUTICS



Lecture Theatre. *Library and Museum.* *Administrative Wing.* *Principal's Entrance*

THE report of the Inter-departmental Committee on the Establishment of a School of Aeronautical Science is now available from H.M. Stationery Office, price 2s. It is a most comprehensive and detailed report and, furthermore, one that we very seriously commend to the most careful study of everyone in any way connected with the field of aviation.

The Committee, under the chairmanship of Sir A. H. Roy Fedden, had as its members Sir Alan Barlow (Treasury), Commodore M. S. Slattery, R.N. (Admiralty), W. P. Hildred, Esq. (Air Ministry), Air Marshal Sir Ralph Sorley (M.A.P.), Sir John Stephenson (Dominions Office), Dr. W. Abbott (Ministry of Education), Sir Charles Darwin (Dept. of Scientific and Industrial Research), and Sir Melvill Jones (Aeronautical Research Committee). Terms of Reference were "The preparation and submission to the Minister of Aircraft Production of detailed proposals for the establishment of a school of aeronautical science within the general framework of the recommendations made by the Aeronautical Research Committee in their report of the 10th August, 1943."

Recommendations

In the preparation of its report the committee consulted the widest possible sources of information, and the recommendations finally made are summarised hereafter:

(i) The primary purpose of the College should be to provide a high-grade engineering, technical and scientific training in aeronautics to fit students for leadership in the aircraft industry, civil aviation, the Services, education and research.

(ii) The College should also provide shorter courses for specialists in particular subjects, refresher courses and a general "staff course" aimed at giving broad knowledge of aeronautics. These courses, especially, should cater for students from industries associated with the aircraft industry as well as for those from that industry, the Services and the other fields referred to above.

(iii) The College should be planned on the basis of an entry of 50 students annually on a two-years' course and 200 students at any one time on shorter courses, *i.e.*, a total of 300 students at any one time. It should be started, however, on a similar scale (as to numbers of students, staff, equipment, etc.), and be built up rapidly.

(iv) The instruction should be at post-graduate level or its equivalent, research should be undertaken by staff and selected students, and attention should be paid to the technology as well as the science of aeronautics.

(v) The College should not be affiliated to any one university but should collaborate closely with the universities, technical colleges, research establishments and industry.

(vi) There should be five main subjects: (*a*) Aerodynamics; (*b*) Aircraft Structures, Engineering and Design; (*c*) Aircraft Equipment; (*d*) Engines and Systems of Propulsion; (*e*) Production, Administration and Maintenance, and there should be a department concerned with Flight and Operations, including full-scale experimental work and flight testing. Adequate provision should also be made for ancillary subjects.

(vii) The conditions of service of the tutorial staff should be comparable with those of university staffs. Some should hold permanent appointments, others appointments for three to five years.

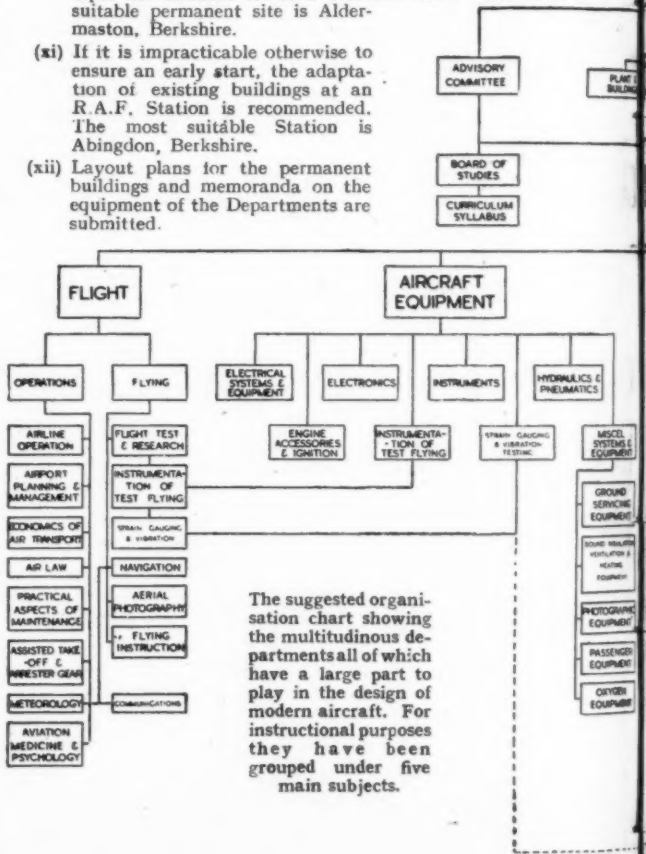
(viii) The ultimate responsibility for the College should rest with the Minister of Education, but the control should not be meticulous. The College should have a Governing Body of its own, representative of all the interests concerned.

(ix) The institution should be called "The College of Aeronautics."

(x) The College should be situated close to its own airfield and within reasonable distance of London and the principal aeronautical research establishments. The most suitable permanent site is Aldermaston, Berkshire.

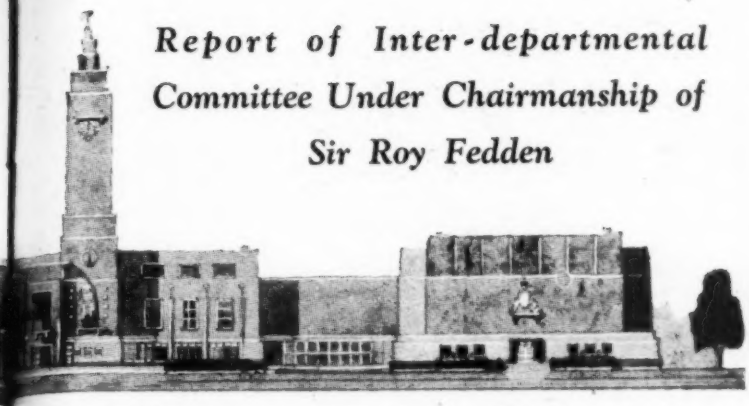
(xi) If it is impracticable otherwise to ensure an early start, the adaptation of existing buildings at an R.A.F. Station is recommended. The most suitable Station is Abingdon, Berkshire.

(xii) Layout plans for the permanent buildings and memoranda on the equipment of the Departments are submitted.



The suggested organisation chart showing the multitudinous departments all of which have a large part to play in the design of modern aircraft. For instructional purposes they have been grouped under five main subjects.

Report of Inter-departmental Committee Under Chairmanship of Sir Roy Fedden



Principal's Wing. *Annexe.* *Great Hall.*

(xiii) The scale of the equipment lies between that appropriate to a university and that for a major research establishment.

(xiv) The estimated capital cost of the permanent College is £2,610,000. The net annual expenditure to be met by the Exchequer is £360,000. The capital cost of the temporary scheme is £400,000 and the net annual expenditure £200,000.

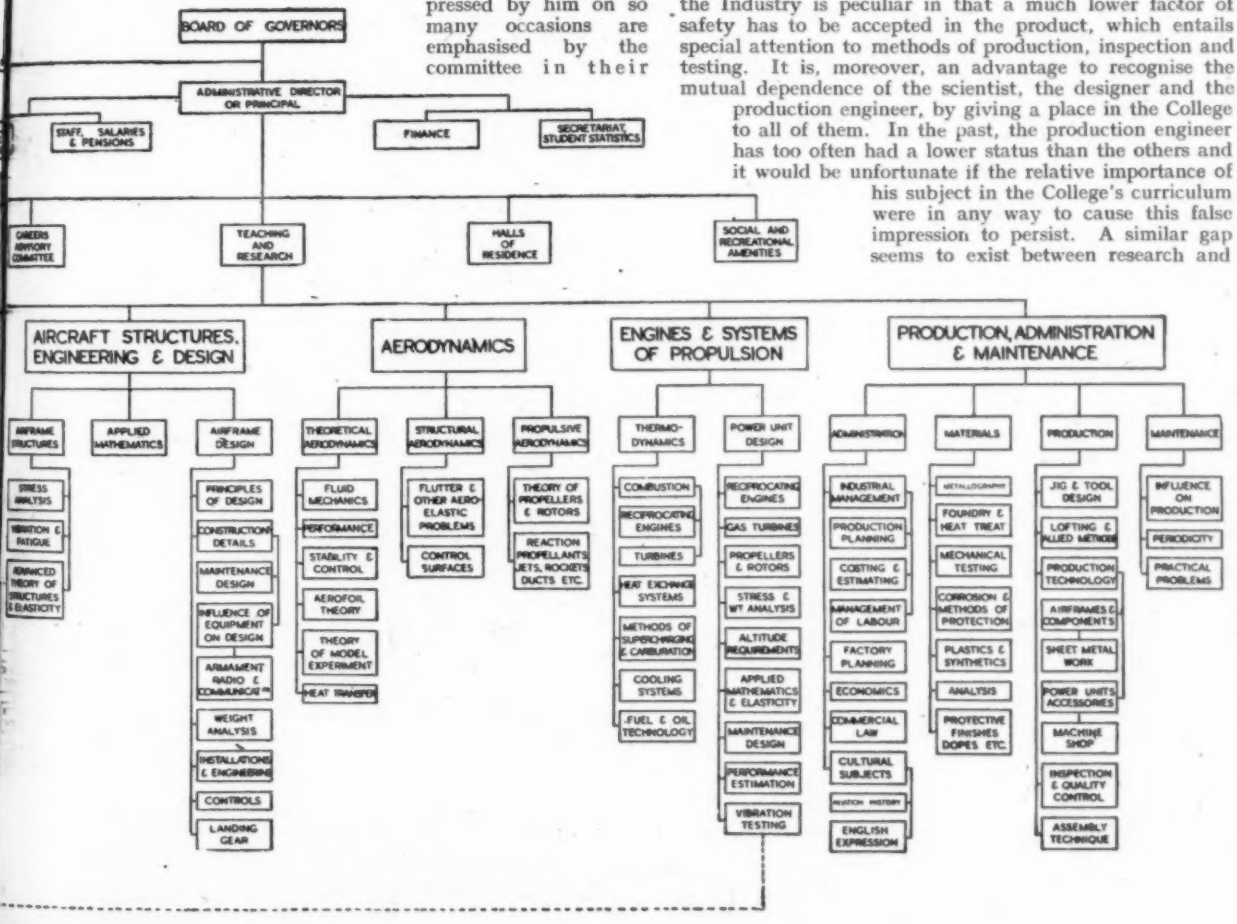
(xv) The establishment of the College is a matter of urgency.

Mr. G. Geoffrey Smith, M.B.E., managing editor of *Flight*, has been a protagonist in the crusade for an aeronautical centre of learning for a considerable time, and the views expressed by him on so many occasions are emphasised by the committee in their report, as follows,. "—— we were not charged with examining the case for such a (Aeronautical) College. We have taken it for granted. Nevertheless, we wish, first of all, to record our sense of its urgency. Although in our deliberations we have had inevitable differences of opinion, none of us questions the need for the College. Now that Air Power has taken its place with Sea Power, the sustained and comprehensive development of the science and practice of aeronautics is vital. . . ."

The primary function of the proposed College is to provide efficient up-to-date teaching over a comprehensive range of advanced subjects, and the recommendation is made that the curricula should include post-graduate courses in subjects of fundamental importance to design, research, and development, together with courses at an appropriate level in other subjects vital to design, manufacture and maintenance.

For the two-years' course the annual intake of students is estimated at about 77, whilst for the shorter courses the annual intake is estimated at 130-135, with an average student population at any one time of 300.

Instruction is to be at a high level such as is best described as post-graduate, although this does not, of course, mean that a University degree is necessary for admission. Research is recommended as having a very important part to play although this field should not overlap the work done by the existing Research Establishments On the subject of Technology the report states: "Although the problems of production in aeronautical engineering are to some extent common to other branches of engineering, the Industry is peculiar in that a much lower factor of safety has to be accepted in the product, which entails special attention to methods of production, inspection and testing. It is, moreover, an advantage to recognise the mutual dependence of the scientist, the designer and the production engineer, by giving a place in the College to all of them. In the past, the production engineer has too often had a lower status than the others and it would be unfortunate if the relative importance of his subject in the College's curriculum were in any way to cause this false impression to persist. A similar gap seems to exist between research and



A COLLEGE OF AERONAUTICS

production. Too little attention seems to have been given to the training of development engineers, who require a wide experience, creative imagination, and the ability to interpret, co-ordinate and adapt, if they are to shape the means offered by research to the ends of production. The future of aeronautics in this country cannot be assured without advancing the standard of development, production engineering and industrial administration as well as promoting research. It has been suggested to us in evidence that, at present, the deficiencies are even greater in the former respect than the last. However this may be, it is clear that the College would be inadequate if it provided for training in research and neglected the problems of developing rapidly and producing efficiently the usable article that research makes possible. The College should therefore be concerned with technology as well as science in the narrow sense."

In addition to the five main subjects there are to be a Flight and Operations department and also instruction in ancillary subjects such as navigation, meteorology, etc. Flight and Operations is intended to cover (i) full-scale experiments and their correlation with laboratory results; (ii) instruction in flight testing; and (iii) the practical aspects of aircraft performance and maintenance. Suggestions are given in the report as to what should constitute the main types of course. These fall into two Groups:—

1. (i) A two years' course to be taken by students of graduate or equivalent educational standard. Some would be graduates and have had not less than a year's industrial experience; others would be drawn from those who, having started in the works and acquired their education by part-time study, up to the standard of the Higher National Certificate, gave promise of occupying positions of responsibility. The course would cover all the main subjects of instruction with some provision for ancillary subjects, and would be designed to produce not the narrow specialist but the man with an all-round knowledge at a high level. Towards the end of his course each student might undertake one or more approved investigations or similar studies, to be preserved in the College for reference, as a gauge of his proficiency and ability.

   (ii) Specialist courses to be taken by students of the same type as at (i) but poviding advanced instruction in one or two subjects only; ancillary subjects might also be included. These courses would vary in length from, say, three months to a year. The level of instruction would be at least as high as (i); the front would be narrower.

   (iii) Refresher courses varying in length according to the subject, for students already of considerable experience, who require to be brought up to date in the latest aeronautical developments. These courses, primarily for the Services, might also be used by others, *e.g.*, teachers or lecturers, requiring specific information on a particular aeronautical development.

2. A general course in aeronautics for men already of some standing in the Services and Government Departments as well as the Industry. The aim would be, in a course lasting perhaps six months, to provide a wider knowledge of the content of aeronautics than can be derived from every-day experience with its specialist tendency. Possibly, in time, the need for this provision will diminish as the number grows of those who have taken course (i) in Group 1.

With regard to the staff the proposals are for:—

Heads of Departments	5
Supervisor of Flight Experiments	1
Senior Lecturers	19
Junior Lecturers	26
Chief Chemist	1
Superintendents of Laboratories and Design Office	4
Experimental Assistants	2
Radiographist	1
Test Pilots	5
Flight Test Technicians	3
Pilot Instructors	3
	70

In addition, a number of mechanics, draughtsmen, demonstrators computors, electricians, storekeepers, etc., perhaps 80 in all, will be required.

It is, unfortunately, one of the consequences of the lack of such a College up till now that staff of the right quality will not easily be obtained. While it is unlikely in the early years that the full number will be needed, the problem of obtaining the services of those who are can be foreseen. From the point of view of equating the supply with the demand, it may be aggravating the problem to reiterate the importance of high quality. Nevertheless, it is of cardinal importance and should not be sacrificed because of any temporary stringency. On the shoulders of the staff, especially in the early days, will rest most of the responsibility for setting the standards and establishing tradition. Their careful selection is perhaps more crucial than any single measure in the establishment of the College. Without teachers who are worthy of them, it would be useless to be discriminating in the admission of students. And without teachers with the skill and resource to use them to the full advantage, the buildings and equipment would only be dead instruments and passive tools.

Standards for Admission

It is recommended that there should be a Board of Entrance to determine the standards for admission. This should not be done by examination but by an interview of those candidates who, on the evidence of their applications, possessed the qualifications recognised as sufficient.

The Aeronautical Research Committee were strongly of the opinion that the College must be situated near its airfield, on the ground that continuous contact with flying was most desirable as a background for education in aeronautics. This view is supported in the report together with the belief that sufficient use can be made of the facilities both in experimental work and in flying practice and instruction to justify the College having an airfield of its own. After considering the various conditions to be met the Committee consider that the College should be located in the vicinity of Aldermaston, Berks, or Dunsford, Surrey.

Brief reference is made in the report to the salient features in each department, although these features are elaborated in the various appendices to the main report.

(i) *Aerodynamics.*—The equipment for this department must include a battery of small slow-speed wind-tunnels on which the more general exercises can be carried out. The technique of the subject, however, is advancing rapidly and more elaborate and specialised equipment is needed for the higher branches of study, although, obviously, the largest and most expensive apparatus is more appropriate to a research establishment than to this College. A middle course has therefore been adopted, and the equipment put forward includes only one tunnel involving high capital cost. This item is regarded as highly desirable for teaching at the high level appropriate to the College.

Special attention has been given to the desirability of relatively low running and maintenance costs.

(ii) *Aircraft Structures, Engineering and Design.*—This department is concerned with the principal subjects of airframe design, and apart from one item, the equipment recommended is not elaborate. The exception is a slow-speed general purposes wind tunnel, sufficiently large to accommodate the fuselage of a small aircraft, complete with tail unit and airscrew. There is a strong case for the inclusion of such a piece of equipment separately in this department, and this will avoid interference with the Aerodynamics Department for the many structural and design experiments involving a large airstream. Other equipment includes various types of testing machine, and provision is made for a suitable drawing office.

(iii) *Aircraft Equipment.*—The apparatus consists of a multitude of small items appropriate to the manifold branches of the subject. The aim has been to make an up-to-date selection adequate for instruction and practical work on all the services that are essential to the operation of the modern aircraft, and its structural

and flight testing. Special attention has been paid to aircraft Electrics, Electronics and Instrumentation.

(iv) *Engines and System of Propulsion.*—This subject is so wide that a great deal of equipment is required to cover demonstration and practical work. In the reciprocating engine field much can be done with single cylinder units, and a battery of these is therefore recommended, supplemented by two large test beds for full-scale investigations and instruction. Gas turbines are still in their infancy, and the equipment recommended as being adequate in the present state of the art is relatively simple and inexpensive. Provision has also been made for low temperature experiments, and for various test rigs to cover such items as supercharging, carburation, ducting, airscrews, accessories and individual components. A special section is devoted to work on fuels and oils.

(v) *Production, Administration and Maintenance.*—While this department will work in very close collaboration with industry, nevertheless, a certain amount of equipment will be required at the College itself. It is recommended that there should be a prototype machine shop, in which parts would actually be fabricated by students, a standards room and inspection department, and a sheet metal shop. Provision is made for a representative selection of machine tools and heat-treatment equipment.

(vi) *Materials.*—This section, which for organisation purposes has been dealt with as part of the Production department, is ancillary also to the various design departments and requires a comprehensive range of special and general-purpose equipment. The apparatus recommended, which covers the field from chemistry and metallography to plastics and crystallography, is not elaborate, but has been selected as the minimum necessary for adequate up-to-date teaching of all these important subjects.

(vii) *Flight and Operations.*—The principal function of this department is to provide facilities for practical full-scale experiments and their correlation with laboratory results. The equipment therefore comprises a number of suitable aircraft of various types which can be used as flying laboratories, and a maintenance workshop. The preparation of aircraft for such work usually involves considerable ground work and a comparatively large fleet is therefore necessary to ensure continuity of demonstration.

The cost of these proposals is considerable, and is dealt with in some detail, but the view is expressed that, as this is to be a College concerned with a science that depends increasingly on elaborate technique for which new and highly specialised apparatus is always being devised, it is impossible to set up such an establishment without heavy initial expenditure and also a reasonable provision for annual replacement and addition. Briefly the capital cost of the College is given as:—

Buildings	£1,380,000
Essential services	20,000
Equipment	1,210,000
	£2,610,000

The annual expenditure is more difficult to gauge, but a tentative budget is given as:—

Salaries and wages, including superannuation ..	£80,000
Other running expenses, including heat, lighting, power and maintenance	80,000
Depreciation and replacement of equipment ..	100,000
Special expenditure on experimental work in aerodynamics and engine departments	50,000
Expenditure on flight and operations depatment ..	70,000
	£380,000

The Committee recommend that the students should be charged the actual cost of their maintenance, and express the hope that local education authorities will be prepared to provide scholarships, whilst no doubt some, at least, of the students from industry will be maintained by their employers. But the proposal is firmly made that, in the interests of students, the maintenance charge should be a fixed rate inclusive of all necessary items.

On the subject of tutorial fees is said that it would be impracticable to charge fees at a rate proportional to the actual cost of tuition, on any basis of calculation. After reviewing the scale of tuition fees in comparable institutions, however, it is recommended that the fee per year should be £75, with proportionate rates for shorter courses. This is an astonishingly low figure in consideration of the type and level of instruction envisaged.

In conclusion the Committee state that although they were not concerned with aeronautical education generally, they felt bound to point out that a structure such as they have proposed must be securely based. Attention should also be given to the facilities for aeronautical education in the technical colleges and universities, otherwise the flow of suitable students to the College will be dried up at the source. The College cannot flourish as it should unless there is a general improvement in aeronautical education.

It follows that the College should be established with sufficient space and resources to enable it to develop naturally in response to increasing and even novel demands. Nor is liberty important to it only in the physical sense. The Aeronautical Research Committee asked that it should be conducted "in an atmosphere of freedom and enterprise." Those whom this College will train, and indeed those who train them, will spend most of their useful lives as pioneers on the frontiers and marches of aeronautical knowledge; in science or art, they will lead its advance into the unknown. The frontiersman is characteristically bold and energetic, restless and resourceful in adapting what he finds new. These are the qualities that will be needed and, if it is to breed them, the Collge must be allowed to develop, in all its activities, the atmosphere of freedom and enterprise that is natural in a frontier community. How this liberty is to be reconciled with the control inseparable from financial dependence on State subvention is perhaps the most vital problem of all for those who establish it and govern its destiny.

THE ROYAL AIR FORCE ASSOCIATION

HAVING as its prime purpose the playing of an active part in the maintenance of stability when the war is over, the Royal Air Force Association has launched a publicity campaign to tell the world about itself, its aims and objects and its methods of striving to achieve them.

This organisation, which is avowedly democratic, non-sectarian, and non-political, exists purely to look after the interests and well-being of its members who are airmen and airwomen of all ranks both while they are actively serving and on their return to civil life—particularly the latter. Having no other axe to grind, the R.A.F. Association gladly co-operates with all other bodies which have the best interests of ex-Servicemen and women at heart, such as the British Legion and the Soldiers', Sailors' and Airmen's Help Society, and works especially closely with the R.A.F. Benevolent Fund.

The broad policy of working for post-war stability is inspired—to come down to practical essentials—by a determination to prevent any of its personnel from becoming destitute or embarrassed after the war.

Nobody can quarrel with such an obviously Christian outlook, but the R.A.F. Association does not content itself with merely giving voice to high-sounding aspiration; it works to establish the sort of background against which its objective shall stand a fair chance of being achieved. In practice this boils down to providing its members with the opportunity to meet under good social conditions.

The first essential for this is that every big town shall have its R.A.F.A. centre where airmen and airwomen can meet in comradeship and in close co-operation with other organisations having similar objects.

A great part of the Association's work is, and always has been, giving help and advice to members during the often difficult period of transition from blue to mufti, and for this it maintains a Pensions Panel, an Employment Advice Bureau, and a Legal Panel, and more facilities of a similar nature are on the way.

Under the patronage of the King, and with Lord Trenchard as President, the R.A.F. Association is doing most valuable work and deserves whole-hearted support from both members of the Air Forces and the general public.

Modern Airscrews—III

Descriptive Review of de Havilland Hydromatic

By

C. B. BAILEY-WATSON

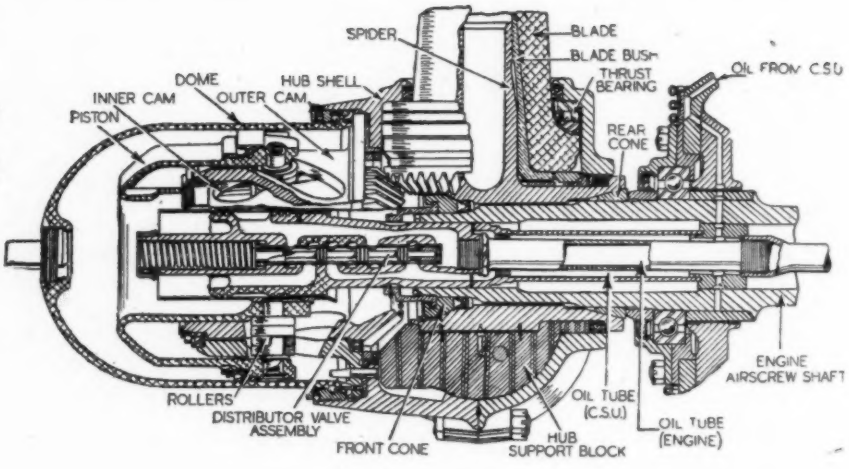


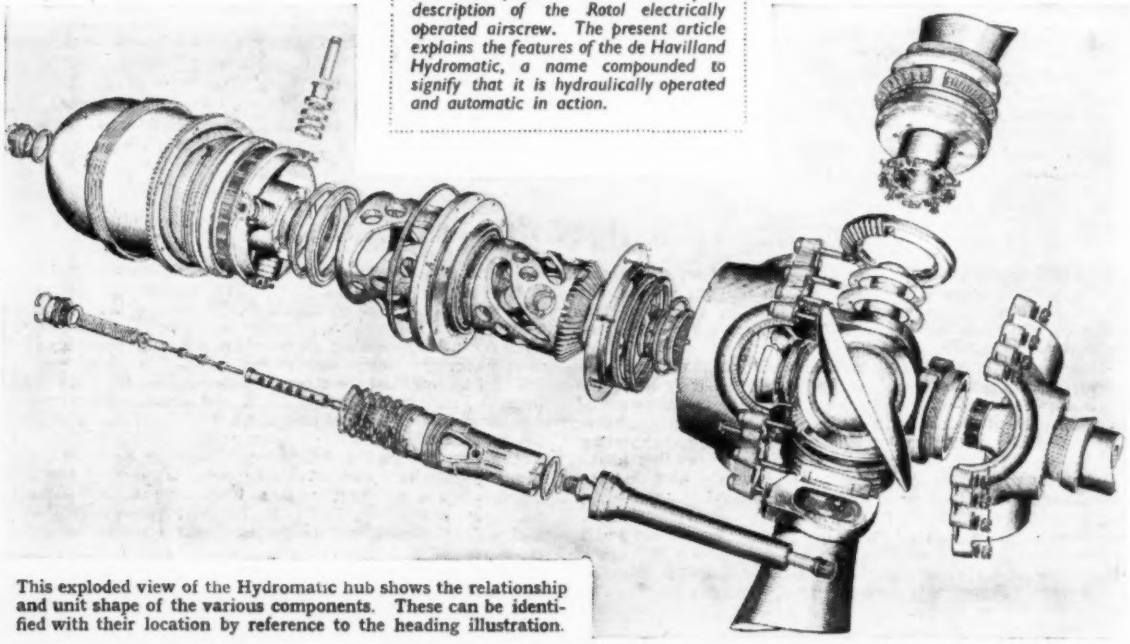
Illustration of sectionalised Hydromatic hub. The several components assembled together can be identified in their relative positions, and the pitch-change actuation can be followed.

THE heart of the Hydromatic airscrew, as, indeed, of other de Havilland and Hamilton models, is a component called a spider, mounted on the airscrew shaft of the engine and consisting of a splined hub carrying three radial "spokes" on which the forged duralumin airscrew blades are mounted. The spider is drawn up on annular cone seatings at each end of the splined bore, and the static and thrust loads are focused and taken upon these, the splines merely transmitting torque.

Each blade has a hollow shank and is mounted upon its appropriate spider arm with a micarta sleeve or bush to take the journal loads, and, in addition, to absorb some of the shaft/blade vibration. Centrifugal loading of the blade is taken by a single-row needle-roller thrust bearing housed in two machined collars which are enclosed between the radius of the blade root and the tip of the blade port in the hub shell. On the root of each blade is fitted a bevel gear segment through which pitch change motion is transmitted from the driving gear of the pitch-change mechanism housed in a dome carried on the front of the hub.

The hub shell is in two parts, being divided in the plane of rotation of the airscrew, with the halves secured together by means of twelve bolts. Internal support for the hub and accurate concentricity and alignment with the spider is provided by three micarta support blocks.

THE first article in this series ("Flight," November 2nd, 1944) dealt with the advantages of variable pitch and described the Rotol hydraulic airscrew. This was followed last week by a description of the Rotol electrically operated airscrew. The present article explains the features of the de Havilland Hydromatic, a name compounded to signify that it is hydraulically operated and automatic in action.



This exploded view of the Hydromatic hub shows the relationship and unit shape of the various components. These can be identified with their location by reference to the heading illustration.

MODERN AIRSCREWS—III

The dome enclosing the pitch-change mechanism itself forms the cylinder for hydraulic actuation, and is secured to the hub by means of a ring-type retaining nut which beds on a series of balls to preclude any tendency to bind when being tightened. Inside the dome is fitted a piston with the central portion of its crown deeply sunken so that, in effect, it is double-skirted, and within the space between inner and outer skirts are housed two co-axial cylindrical cams. These cams are cylinders, in the walls of which are cut helical slots, the slots in the inner cam leading in the opposite direction to those in the outer cam; this latter is a stationary member located on the hub by three dowels and held rigidly in position by the dome. The inner cam, however, is capable of rotation and is supported in ball races located in the ends of the outer cam. Rotation of the inner cam is employed to transmit pitch-change motion to the blade roots, for which purpose its rear end is fashioned as a bevel gear to mesh with the bevel segments on the root of each blade.

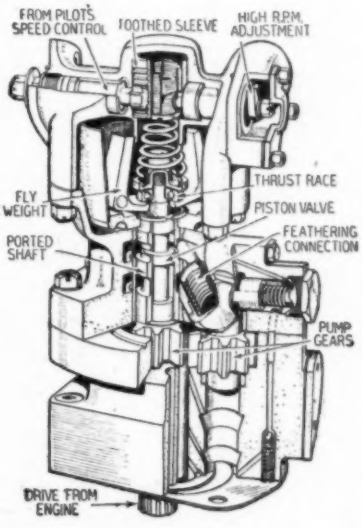
Rotation of the inner cam is generated by movement of the piston, spanning the skirts of which are steel rollers, each roller being radially located in adjacent slots of the cams. Thus, movement of the piston forces the rollers along the slots in both inner and outer cams which, as the latter is fixed, induces the inner cam to rotate. Additionally, by virtue of the opposite helices of the slots, the inner cam rotates for a given piston movement twice as much as it would were the cam slot straight fore and aft.

Pitch-change Actuation

In the centre of the piston is housed an open sleeve which, in turn, houses the forward end of the distributor valve assembly. The purpose of this latter unit is linked with the feathering actuation of the airscrew and will be dealt with later; but the distributor valve casing is screwed to the forward end of the inner of two co-axial oil tubes housed in the hollow airscrew shaft of the engine. Oil from the engine lubricating system, at the system's normal operating pressure, is fed through the inner oil tube to the front of the piston in the dome; whereas oil fed through the outer oil tube to the rear of this piston first passes through the constant speed governor unit (c.s.u.) which incorporates a pump to step-up the pressure.

Before going on to describe the governor unit it might be advantageous to define the principle of the airscrew operation. Pitch-change motion of the blades is imparted by movement of the piston housed in the dome, this piston, as we have seen, being subject to engine oil pressure on its front side, and governor unit oil pressure on its rear side. It has already been mentioned that the c.s.u. steps-up the pressure of the oil it supplies to the rear of the piston so that obviously there is a higher pressure on the rear of the piston than on the front, resulting in a constant tendency to drive it forward.

To combat this, the oil pressure on the front side of the piston is assisted by the centrifugal twisting moment of the blades. This quality is inherent in varying degree in airscrew blades of all designs, and means the physical tendency of a blade to revert to neutral pitch when the airscrew is rotating. It can thus be seen that the c.s.u. high-pressure oil delivery to the rear of the piston is balanced by the engine oil pressure at the front of the piston which is augmented by the centrifugal twisting moment of the blades.



The Constant Speed Unit, showing general assembly. Operation of the piston valve by the centrifugal governor can be seen.

The constant speed governor unit is engine driven and consists essentially of a gear-type pump, a piston valve and a centrifugal-type governor. Drive from the engine is imparted to a hollow shaft on which the "drive" gear of the pump is mounted, whilst the opposite end of the shaft carries the centrifugal governor. This controls the piston valve, which can slide inside the hollow drive shaft and is provided with lands to open or close ports in the c.s.u. oil passages. Control of the piston valve is effected by the action of centrifugal force upon L-shaped fly-weights, pivoted at the angle and so arranged that the short arms exert a lifting pressure on the outer race of a ball thrust bearing carrying the governor spring collar. This collar houses one end of a conical spring the exertion of which is controlled by a rack and pinion assembly operated by movement of the pilot's speed-control lever.

Constant Speed Effect

Thus it is that for any constant engine r.p.m. the fly-weights will automatically take up a vertical position in equipoise with the spring exertion, and, as the c.s.u. is engine driven, the r.p.m. of both engine and governor are fixedly proportional and are dependent only on the setting of the pilot's control.

Whilst the fly-weights are in a vertical position the lands on the piston valve blank-off the output port through which oil is fed to the pitch-change mechanism, so that no oil flow is possible and the blade pitch thus does not change. If, however, the load on the engine is relieved, the r.p.m. naturally tend to increase. When this occurs the fly-weights immediately fly out and lift the piston valve. The effect of this is to open the output port to the high-pressure feed of the c.s.u. pump which, acting over the area of the piston in the dome, forces it forward to coarsen the blade pitch and so bring the r.p.m. back to normal and, consonantly, the fly-weights back to the vertical. Oil in front of the piston is displaced back into the engine oil system.

Conversely, should the load on the engine be increased, the r.p.m. tend to fall, correspondingly causing the fly-weights to fall inward. This moves the piston valve so that its lands blank-off the feed from the c.s.u. pump and open the output port; this now reverses its function and permits oil at the rear of the pitch-change piston to be expelled back through the c.s.u. to the engine sump. By virtue of opening the oil passage to drain, the balanced forces on the dome piston are negatived and the combination of engine oil pressure and blade centrifugal twisting moment expels the oil at the rear of the piston, the rearward movement of which fines-off the blade pitch to permit the engine r.p.m. to return to their set value.

So much for the constant-speed operation of the Hydromatic airscrew. There still remains, however, one more operational aspect—that of feathering. This operation involves the employment of a separate electrically driven feathering pump of high output, which delivers oil at high pressure via a non-return valve into the output duct of the c.s.u. Opening the non-return valve also blanks-off the output duct from the c.s.u. pump so that the feathering pump delivery is fed direct to the rear of the pitch-change piston.

We must now go back to the cams in the pitch-change mechanism. The cams slots are, as has been mentioned, of helical form, but the helix is constant only for a portion

MODERN AIRSCREWS—III

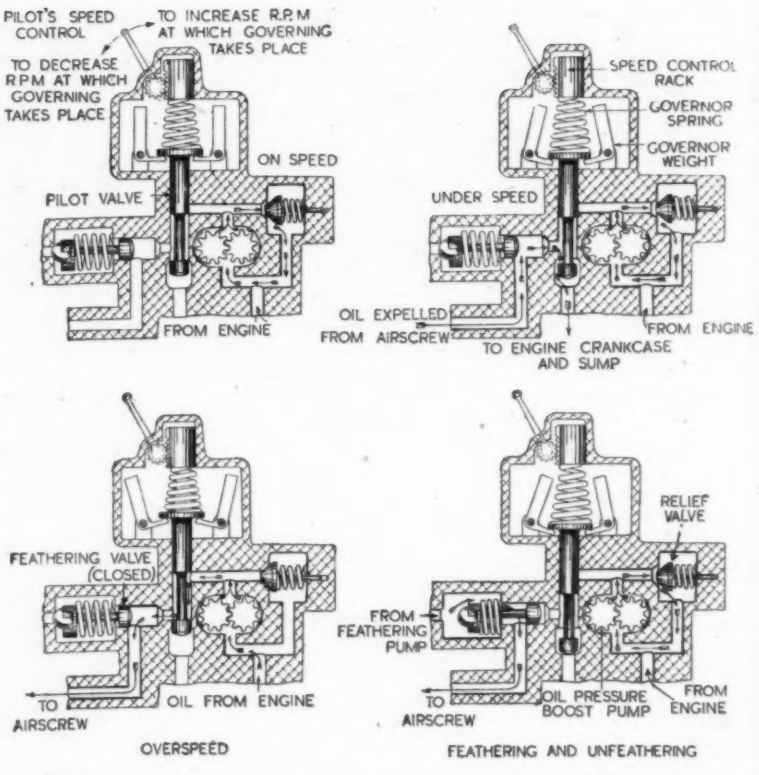
of the slot length, the remaining amount of slot being turned at an angle to the normal helical path. The result of this is that the inner cam only rotates so far under the influence of piston movement at normal pressures, and when the rollers come up against the angle in the slot they will normally go no farther; thus a coarse pitch limit is "built in" the cams. However, when the piston is subjected to the high-pressure delivery of the feathering pump, sufficient power is applied to cause the rollers to make the abrupt turn in the cam slots, and this latter slot path being of much less "lead" than the normal, feathering rotation of the inner cam is quicker, and with it, rotation of the blades to the feathered position. The feathering pump is automatically cut out when the blades are feathered and pressure builds up to a value sufficient to operate a pressure cut-out switch in the pump circuit.

Unfeathering

When the pilot wishes to feather the airscrew he first presses a push-button to bring into action the feathering pump, then closes the throttle and finally switches off the engine. The operation of the mechanism is then as described. To unfeather the blades is rather a different story as it involves the distributor valve assembly referred to earlier. The sequence is that the pilot makes sure his speed-control lever is in the "constant-speed" position then again presses the button, bringing into action the feathering pump. When the blades are in the feathered position the oil pressure on both sides of the piston sinks to zero—the feathering non-return valve in the c.s.u. closed when the feathering pump delivery was cut-off and the oil passage was thus opened to drain, likewise as the engine stopped the oil system pressure fell to zero.

Consequently, when the feathering pump is again engaged to unfeather the blades, the pressure is built up behind the piston which is at its forward limit of travel, but the pilot must continue to hold down the feathering switch to prevent the pressure cut-out operating. The high pressure generated then acts over the area of lands on the distributor valve, moving the valve against a spring so that ports are uncovered which allow the feathering pump oil delivery to be transferred to the *front* of the piston and open the *rear* side of the piston to engine drain. Thus the oil flow is reversed. This forces the piston back so unfeathering the blades which, as they start to "windmill," assist the action by their centrifugal moment. When the engine is turning over at reasonable r.p.m. the pilot releases the feathering pump switch so that delivery is cut off, and the distributor valve at once snaps back to its normal position. With the stoppage of the feathering pump and the increase of engine oil pressure, return to the constant-speeding pitch setting of the blades is rapid.

(To be continued.)



These diagrams show the c.s.u. operative conditions and schematic oil flow through the unit for various stages of operation. The c.s.u. gear pump increases the pressure of oil fed from the engine lubrication system, and when no feed from the pump is being used the relief valve opens and vents the oil back to the suction side.

London-Liverpool Air Service

MONDAY last saw the reinstatement of the passenger air service between London and Liverpool—the first internal civil air service to be resumed since war began and a pleasant indication of "things to come."

Operated by Railway Air Services, the resumed service links up with the Liverpool-Belfast and Liverpool-Isle of Man services, both of which have been maintained on a wartime basis.

Ten-seater de Havilland D.H.86 four-engined airliners are being used for the present between London and Belfast, passengers changing aircraft at Liverpool. The service from Liverpool to the Isle of Man, however, is operated by the smaller two-engined D.H. Rapide aircraft, which is more suitable for flying in and out of the small Manx airport.

Aircraft leave Croydon at 9 a.m. every weekday and are due at Speke (Liverpool) at 10.45 a.m. Here passengers for Belfast must pass through certain security formalities before emplaning at 11 a.m. for the 1½ hr. sea crossing to Northern Ireland. Passengers for the Isle of Man, however, can transfer immediately to the Manx aircraft, which is scheduled to reach Ronaldsway at 11.45 a.m. Road transport is provided between the West End and Croydon, and between Liverpool, Belfast and Douglas and their respective airports, and is included in the following fares: London-Belfast, £8 single, £13 return; London-Isle of Man, £6 7s. 6d. single, £10 5s. return; London-Liverpool, £4 10s. single, £7 return.

For the return journey, a new service leaves Belfast at 1 p.m. which is due at Speke at 2.30 p.m., and connects there with the London service, arriving at Croydon at 4.30 p.m.

Passengers taking return tickets who desire to make the return journey by steamer and rail can exchange their tickets and obtain a refund of the difference due to them, or, alternatively, passengers in possession of the return halves of rail and steamer tickets between the points the air services operate can return by air—subject to accommodation being available—on payment of a supplement. This feature of the Railway Associated Air Services is extremely popular.

Tickets can be obtained at Olley Air Services, Ltd., 7b, Lower Belgrave St., and the Main London railway stations, 24, Donegall Place, Belfast, and Lime Street, Liverpool.

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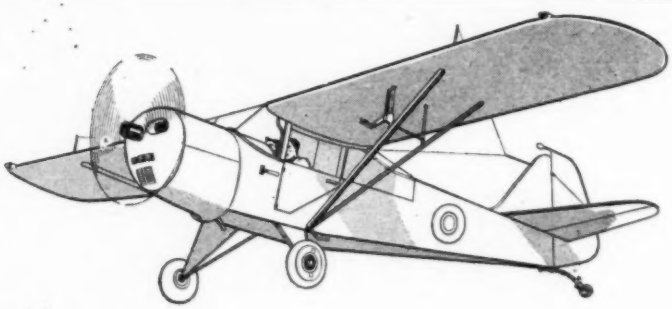

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CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"LET'S RECOLLECT"

Wright Bros. were at Pau in 1908

I SHOULD like to add a few observations to those of your correspondent J. M. Henderson, whose letter of October 19th referred to the "Let's Recollect" advertisement in *Flight* for September 21st. I believe the Wright Brothers were at Pau and Le Mans, and later many other places in France during the spring, summer, and autumn of 1908, culminating in their winning the Michelin Cup of 1908, together with the cash prize of 20,000 francs. They only had two serious competitors—Henry Farman and Mr. J. T. C. Moore-Brabazon, who did not fly due to his mechanic being injured.

Hendon aerodrome was opened to the public on October 1st, 1910, by M. Louis Blériot. In view of the fact that this was two years after the Wrights' visits to France, I should say that the photograph in *Flight* was Pau, as Mr. Henderson suggests. On the other hand, many early enthusiasts flew Wright-type machines built in this country. For instance, there were six Wright machines flying at the first International Aviation Meeting at Rheims on August 22nd, 1909. One of Mr. J. T. C. Moore-Brabazon's early machines was a Wright biplane built under licence by Short Bros. I believe the Hon. C. S. Rolls and Mr. H. Ogilvie also flew British-built Wright biplanes.

In conclusion then, it may be Hendon and a Wright biplane, but not the Wright Bros., or perhaps it is Pau and the Wright Bros.

DEREK MOORE-HEPPLESTON.

WHAT DID YOU DO . . . . ?

A Word for the "Clipped Wingers"

ONE of these days, no doubt, a rosy-cheeked youngster is going to ask the rather pointed question, "What did you do in the war, daddy?" and, through no fault of his own, daddy is going to be on the proverbial spot.

There must be many hundred types like myself whose record of service discloses at least one "blank" year (two in my own case), who cheerfully burned gallons of petrol, and the taxpayer's money, in quest of pilot's "wings" and who, through some latent physical, mental, or moral defect, just didn't "make the grade."

It is, of course, a tribute to the training system of the R.A.F. that those of us who did contrive to reach the latter stages of S.F.T.S. were gently, but firmly, persuaded to seek our fortunes elsewhere, for although most of us could pilot an aircraft without causing grievous bodily harm, we failed to acquire "in the time allotted to instruction" that finesse of touch and control which is, to my mind, the essence of modern flying. Consequently we were not fit to be pilots in the R.A.F., and although some of us needed quite a bit of convincing on that point, I for one credit myself with enough common sense to respect the advice of hoary old C.F.I.s, most of whom were flying bits of wire and canvas before I was born, or even thought of.

But it does touch us "clipped wingers" on the raw to have to keep on explaining to all and sundry that we spent a year or two of total war failing as pilots. Anyway, it is rather rough justice, for the effort was there.

Accordingly I suggest, to begin with, that all those with 100 flying hours or over as pilots "u/t" to their discredit be given a chit or something to that effect. It would help to prevent those awkward questions, as well as providing a practical token of one of the things which daddy did do in the war.

"ICHTHUS."

[Our correspondent need not worry unduly. Experience after 1918 showed that our rosy-cheeked youngsters never asked us what we did.—ED.]

THE AIR AND SHIPPING

Members of C.I.A.T.O.

IN the very interesting article by Macviator on "The Air and Shipping" in your issue of November 2nd, the writer was good enough to refer to this organisation, but I should like to draw your attention to the fact that the present members of the Conference of International Air Traffic Operators are: Aer Lingus Teoranta, Aeroput, Bristol Industries (Air Freighters), Ltd., Ceskoslovenska Letecka Spolecnost, Ceskoslovenske Statni Aerolinie, Det Danske Luftfartselskab, Det Norske Luftfartsselskap, North Eastern Airways, Ltd., Polish Air Lines "LOT," Ltd., Portsmouth Aviation, Ltd., Transport Aeriens français, S.A.B.E.N.A., Svenska Aero Lloyd and Wrightways, Ltd.

Four of the companies mentioned by the writer of this article, viz.: Air Dispatch, Ltd., Overseas Transport Co., Ltd., Western Airways, Ltd., and British Latin American Air Lines, Ltd., are not members of the Conference.

RONALD BRADEN,
Secretary to the Conference.

OBSERVATION BALLOONS

Their Use Now Worth Considering

AS we now have almost complete command of the air, the possibility of using observation balloons for artillery co-operation would seem worth considering.

We often hear and read that the ground ops. have been blotted out by smoke shells, and that aircraft work under difficulties owing to low visibility.

When the ground ops. are out of action observation balloons could well take their place and so provide new eyes for the artillery; there might be occasions when an observation balloon could ascend in a fog which would prevent aircraft from working and its observers able to spot owing to its being clearer behind the enemy lines. For flash-spotting, for example, a captive balloon would probably be of more value than a moving aircraft, especially at night time, when the balloon would be much less vulnerable.

The French doctrine was to use ground ops. when possible, and then if balloons could do a particular job as efficiently as aircraft, the balloon was to be used in preference. Thus aircraft are saved for other duties, as the French found those balloons, especially when mobilised, useful until June, 1940.

As the Germans and Russians still employ them on the Eastern Front, it looks as if the observation balloon is of value even in modern war.

ENSIGN.

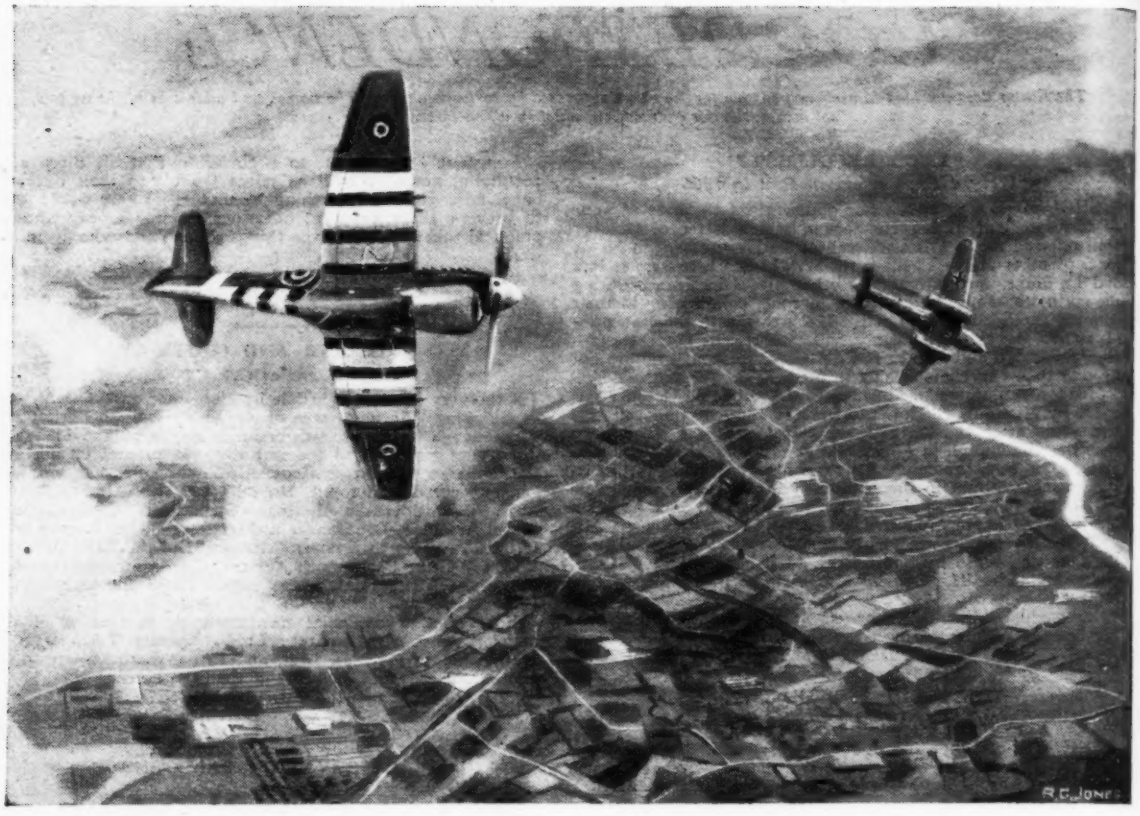
BOOK REVIEWS

"P for Polly." By A. E. Lowy. Illustrated by Ursula Birnstingl. The Favil Press. 6s.

THE title of this little book sounds like the name of a bomber, but the younger children of *Flight* readers will find it far more exciting than that. For this tale of a magic aircraft, acquired from a parrot in a mysterious toyshop for the small fee of a magic half-crown that became an even more magic sixpence, might well have been called "Dick Through the Telescope." It is, in fact, a modern fairy story very much in the "Alice" vein, and it points the moral that "There is more than one way of looking at things." Mr. Lowy has a sure touch in this delicate field, for he writes with a charming simplicity which is all too rarely encountered these days. Yet he is never guilty of "talking down" in that patronising way so often affected by authors of children's books—to the intense irritation of many of their readers. The toy situation being what it is, this book makes a timely appearance when Christmas presents for the youngsters are being anxiously sought.

The Logic of War. By Murray Harris. George Allen and Unwin, Ltd., 10s. 6d.

SQN. LDR. MURRAY HARRIS is a brother of Air Chief Marshal Sir Arthur Harris, but his book has comparatively little to say about the air. Its text is the dictum of the German General von Willisen: "Strategy is the study of communications." The author states: "Rail can carry more than road, but of all means of transport the ship is by far the most efficient and economical." From this point of view he examines the present war, and his observations are full of interest and sense. The book was published before the Invasion of France took place and so is, in some respects, out of date; but principles are not affected by day-by-day occurrences.



An impression by R. G. Jones of a Hawker Tempest chasing an Me 262 jet fighter. It is known that at least one of these fighters has fallen to a Tempest's guns. Particulars of the German jet fighters appear on pages 526—528.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

IT is announced from Supreme Headquarters that the Deputy Chief of Staff (Air) has been granted the acting rank of Air Marshal.

Air Marshal J. M. ROBB, C.B., D.S.O., D.F.C., A.F.C., early this year was Deputy to Lt. Gen. Spaatz, at that time commanding the N.W. Africa Air Forces.

GENERAL DUTIES BRANCH.

Air Comdre. A. L. FIDDAMENT, C.B.E., D.F.C. is granted the rank of Act. Air Vice-Marshal. September 16th, 1944.

Air Commodore N. L. DESOER is granted the acting rank of Air Vice-Marshal, Sept. 29th, 1944

Appointments

THE Air Ministry announces the following appointments:—

Act Air Comdre. J. R. SCARLETT-STREATFIELD to be A.O.C. of a Group in Fighter Command, and to be Act. Air Vice-Marshal.

Air Comdre. S. D. MACDONALD to be Senior Air Staff Officer of a Group in Fighter Command.

Air Comdre. H. P. FRASER, A.F.C., to be Deputy Air Officer-in-Charge of Administration, 2nd Tactical Air Force.

Act. Air Comdre. W. A. D. BROOK, C.B.E., to Headquarters A.C.S.E.A. for Air Staff (Plans) Duties.

Group Capt. L. W. DICKENS, D.F.C., A.F.C., to H.Q., Bomber Command, for Air Staff duties, and to be Act. Air Comdre.

Group Capt. L. G. HARVEY to be Deputy Air Officer-in-Charge of Administration (Maintenance) Transport Command, and to be Act. Air Comdre.

Air Vice-Marshal Scarlett-Streatfield was Air Officer Commanding Malta at the beginning of this year. He has specialised in navigation.

Air Comdre. Macdonald has been Senior Air Staff Officer of another Group of Fighter Command (then A.D.G.B.) since last March. He entered the R.F.C. as a cadet in 1917, and served during the last war in Mesopotamia. Since then he has seen much service in Iraq, Palestine, Egypt and the Levant.

Air Comdre. Fraser has recently held a staff post in the Second Tactical Air Force. He specialised in Army Co-operation, both at home and in India, and later in engineering. He is a graduate of the Staff College. In 1937 he was awarded the A.F.C.

Air Comdre. Brook has been Senior Air Staff Officer of a Group in Bomber Command since May, 1942. He has seen service in India, Iraq and Palestine, and is a graduate of the Staff College.

Air Comdre. Dickens has commanded an air station in Great Britain since January this year. In 1939 he went to France in command of a squadron, and in 1940 to Canada on Air Staff duties. He was awarded the A.F.C. in 1939 and the D.F.C. in 1940.

Retirement

MEDICAL BRANCH

Air Commodore (temp. Air Vice-Marshal) Sir W. TYRRELL, K.C.B., D.S.O., M.C., M.B., B.Ch., D.P.H., reverts to the retired list, retaining the rank of Air Vice-Marshal. Oct. 20th, 1944.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards:—

For outstanding courage, skill and determination in pressing home a successful attack on the Japanese Naval base at Sabang:

Distinguished Service Cross

Temp. Lt. Cdr. (A) N. S. HANSON, R.N.V.R.
Temp. Lt. (A) P. S. COLE, R.N.V.R.
Temp. Sub Lt. (A) F. B. HEFFER, R.N.Z.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following award:—

George Cross

Air Comdre. A. D. ROSS, O.B.E., R.C.A.F.—One night in June, 1944, an aircraft while attempting to land crashed into another which was parked in the dispersal area and fully loaded with bombs. The former aircraft had broken into three parts and was burning furiously. Air Comdre. Ross was at the airfield to attend the return of aircraft from operations and the interrogation of aircrews. Flt. Sgt. St. Germain, a bomb aimer, had just returned from an operational sortie, and Cpl. Marquet was in charge of the night ground crew, whilst L.A/C. McKenzie and L.A/C. Wolfe were members of the crew of the crash tender. Air Comdre. Ross, with the assistance of Cpl. Marquet, extricated the pilot, who had sustained severe injuries. At that moment ten 500lb. bombs in the second aircraft, about 80 yards away, exploded, and this officer and airmen were hurled to the ground. When the hail of debris had subsided, cries were heard

SERVICE AVIATION

from the rear turret of the crashed aircraft. Despite further explosions from bombs and petrol tanks which might have occurred, Air Comdre. Ross and Cpl. Marquet returned to the blazing wreckage and endeavoured in vain to swing the turret to release the rear gunner. Although the port tail plane was blazing furiously, Air Comdre. Ross hacked at the perspex with an axe, and then handed the axe through the turret to the rear gunner, who enlarged the aperture. Taking the axe again, the Air Comdre, assisted now by Flt. Sgt. St. Germain as well as by Cpl. Marquet, finally broke the perspex steel frame supports and extricated the rear gunner. Another 500lb. bomb exploded, which threw the three rescuers to the ground. Flt. Sgt. St. Germain quickly rose and threw himself upon a victim in order to shield him from flying debris. Air Comdre. Ross's arm was practically severed between the wrist and elbow by the second explosion. He calmly walked to the ambulance, and an emergency amputation was performed on arrival at station sick quarters. Meanwhile, Cpl. Marquet had inspected the surroundings, and, seeing petrol running down towards two nearby aircraft, directed their removal from the vicinity by tractor. L.A/C.s McKenzie and Wolfe rendered valuable assistance in trying to bring the fire under control, and they also helped to extricate the trapped rear gunner, both being seriously injured by flying debris.

Air Comdre. Ross showed fine leadership and great heroism in an action which resulted in the saving of the lives of the pilot and rear gunner. He was ably assisted by Flt. Sgt. St. Germain and Cpl. Marquet, who both displayed courage of a high order. Valuable service was also rendered by L.A/C.s McKenzie and Wolfe in circumstances of great danger.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Bar to Distinguished Service Order

Act. Wing Cdr. C. L. GREEN, D.S.O., D.F.C., R.A.F.O.—Within recent weeks this officer has led formations of aircraft on numerous sorties, during which outstanding successes have been obtained. On two occasions he was responsible for locating large concentrations of enemy armour, which were subsequently attacked with great effect. Eighty-nine tanks were destroyed and a large number damaged; many other armoured vehicles, transport wagons and guns were also destroyed. Throughout these operations Wing Cdr. Green set an example which inspired all. His leadership was exceptional and his skill and bravery of the highest order.

Distinguished Service Order

Wing Cdr. D. S. RADFORD, D.F.C., A.F.C., R.A.F., No. 10 Sqn.—This officer has displayed the highest standard of courage and devotion to duty. His leadership and organising ability have been outstanding, and much of the success of the squadron can be attributed to Wing Cdr. Radford's personal example. In September, 1944, he was detailed to attack an aerodrome in Holland. Clouds obscured the target on his first two attempts to bomb it, and it was typical of his resolve that he made yet another effort, found a gap in the clouds and this time completed his attack. Among the many targets he has attacked are Leipzig, Stuttgart, Frankfurt and Dusseldorf.

Act. Wing Cdr. P. J. CHANNER, D.F.C., R.A.F.V.R., No. 105 Sqn.—This officer has a long and distinguished record of operational flying. He has invariably displayed exceptional courage and devotion to duty, and his powers of leadership have been outstanding. Since being awarded the D.F.C., Wing Cdr. Channer has completed a very large number of sorties, many of them against dangerous and difficult targets.

Act. Sqn. Ldr. R. G. FROW, D.F.C., R.A.F.V.R., No. 7 Sqn.—This officer has completed a second tour of operational duty. He has pressed home his attacks with exceptional determination and his complete disregard for danger and extreme coolness have been a magnificent example to the members of his crew.

Act. Sqn. Ldr. R. G. GOODWIN, D.F.M., R.A.A.F., No. 635 Sqn.—As navigation leader, Sqn. Ldr. Goodwin has never hesitated to fly on operations with any crew likely to benefit from his advice. He has flown against the most heavily defended German targets, including Berlin on seven occasions. He has consistently displayed a high degree of gallantry and devotion to duty, and his record is worthy of the highest praise.

Act. Sqn. Ldr. P. MAINS-SMITH, D.F.C., R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.—Since being awarded the D.F.C., this officer has completed a large number of sorties, many of them in bad weather. He is a very capable leader, whose coolness and courage in the face of danger have set a fine example to all. He has carried out his duties as flight commander with praiseworthy efficiency, and his devotion to duty throughout his tours has been unfailing.

Act. Sqn. Ldr. H. C. MITCHELL, D.F.C., R.A.F.V.R., No. 139 Sqn.—This officer has displayed the highest standard of keenness and devotion throughout a long period of operational duty. Since being awarded the D.F.C., he has participated in very many bombing missions, including attacks on such targets as Berlin, Hamburg, Kiel and heavily defended centres in the Ruhr. His standard of navigation throughout has been high and has played a prominent part in the successes obtained. He is an extremely zealous member of aircraft crew, and his technical knowledge has proved a tremendous asset to the squadron.

W/O. D. R. Tulloch, who received both the D.F.C. and D.F.M., leaving Buckingham Palace with his sister.

Act. Sqn. Ldr. N. E. REEVES, D.F.C., R.A.F.V.R., No. 239 Sqn.—Within a short period Sqn. Ldr. Reeves has shot down four enemy aircraft at night; two of them fell to his guns over Germany. This officer's brilliant work has been an outstanding example to the flight he commands and has been a great factor in raising the fighting qualities of the formation to a high standard.

Act. Sqn. Ldr. W. C. VANEXAN, D.F.C., R.C.A.F., No. 431 (R.C.A.F.) Sqn.—This officer has completed a large number of sorties since being awarded the D.F.C., and has played outstanding determination and zeal. He has attacked his targets fearlessly, yet with cool and calculated method, which has brought him much success. He is a virile leader and has proved a great asset to the squadron.

Flt. Lt. R. G. DALE, D.F.C., R.C.A.F., No. 1409 Flt.—As observer, Flt. Lt. Dale has completed a very large number of sorties, including many reconnaissances over areas in Germany. His ability has been of the highest standard and his services have been of great value. Many times his aircraft has been intercepted by enemy fighters and many times fired upon by the ground defences, but he has shown a coolness and determination to complete his assignments successfully which has won great praise. In addition to his work in the air, Flt. Lt. Dale has devoted much of his skill towards the training of other members of his unit.

Act. Flt. Lt. G. J. SOUTH, D.F.C., R.A.F.V.R., No. 7 Sqn.—A first-class captain and a most conscientious officer, Flt. Lt. South has been engaged in air operations almost continuously for a year. He has led attacks on a wide variety of targets, including Berlin, Nuremberg, Hanover, Munich, Stuttgart, Kiel and Augsburg, and has always pressed home his attacks with the utmost determination. His example when over these dangerous targets has proved a rare source of inspiration.

Act. Sqn. Ldr. A. J. L. CRAIG, D.F.C., R.A.F.V.R., No. 7 Sqn.—In September, 1944, Sqn. Ldr. Craig and W/O. Davidson were pilot and flight engineer respectively of an aircraft detailed to attack an enemy airfield. Whilst over the target the aircraft was hit by anti-aircraft fire. The starboard fuel system was damaged, causing a serious leakage of petrol. Despite this, Sqn. Ldr. Craig pressed home his attack. The two starboard engines were now useless. Nevertheless, this pilot set course for home. The enemy coast was safely crossed, but, whilst over the sea, height was gradually being lost. All movable equipment was jettisoned to assist in maintaining height, and finally a landing was made at the nearest airfield. Throughout the return flight, W/O. Davidson well proved his engineering skill, and his efforts were of immense value to his captain. In perilous circumstances these members of aircraft crew displayed the highest standard of coolness, courage and determination. Sqn. Ldr. Craig has completed a very large number of sorties, and has proved himself to be an inspiring leader; W/O. Davidson has also participated in many bombing missions and has always displayed the greatest keenness and devotion to duty.

Flt. Lt. S. G. CULLIFORD, R.N.Z.A.F., No. 267 Sqn., Mediterranean Allied Air Forces.

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil.)

Sqn. Ldr. F. A. J. CHAPMAN, R.A.F.—In April, 1944, an aircraft crashed and caught fire at a R.A.F. station. Of the crew of five, one member was thrown clear. The above officer and A/C. Skerritt went into the flames whilst ammunition was exploding all around in order to rescue the remaining members. Sqn. Ldr. Chapman, the chief technical officer at the station, succeeded in dragging clear an airman who was trapped amongst the burning wreckage. F/O. Thomas, a physical training officer, was also able to extricate another member who was caught, near the lower part of his body, by the wreckage. A/C. Skerritt, an airman employed on fire-fighting duties, was successful in extricating one of the pilots from the cockpit. In effecting this rescue, A/C. Skerritt sustained several cuts and bruises and was told to report to sick quarters. He insisted on remaining, however, and helped in putting out the conflagration. All three rescuers displayed courage in dangerous circumstances. Four members of the crew, including the one thrown clear, were saved from the wreckage, a result which was achieved owing to the bravery of these two officers and airman.

M.B.E. (Mil.)

F/O. L. L. THOMAS, R.A.F.V.R.—For citation see Sqn. Ldr. CHAPMAN, O.B.E.

F/O B. THOMSON, R.A.F.V.R.—At about 10.00 hours one day in May, 1944, a four-engined aircraft crashed on a main surface bomb dump which contained a large number of 500 lb. and 1,000 lb. bombs. The aircraft burst into flames immediately and the port outer and inner motors were thrown on to the bombs. F/O. Thomson (the station fire officer) and L.A/C Trotter (the N.C.O.-in-Charge of a crash tender crew) were on the scene almost immediately and fire-fighting appliances from two crash tenders were operating, under F/O. Thomson's direction, within 15 seconds of the crash. Petrol was flowing from the aircraft and a large part of the fuselage and wings were soon burnt out completely; the bombs became too hot to touch. During a hazardous inspection of the fuselage, F/O. Thomson observed one bomb, which had become dislodged from the dump, lying under the main fuselage of the crashed aircraft and in the centre of the fire. He obtained assistance and the bomb was successfully removed. F/O Thomson showed outstanding courage, leadership, and determination and, with L.A/C. Trotter, who also played a valiant part in dangerous conditions, was responsible for the saving of much valuable equipment.

F/O. J. F. SMITH, R.A.F.V.R.—One night in July, 1944, a Wellington aircraft, which was coming in to land, stalled and crashed into a bomb dump The aircraft immediately burst into flames and a large number of 30 lb. explosive incendiary bombs became ignited. Despite the appalling nature of the conflagration, which was greatly increased by the presence of hundreds of gallons of petrol, and high explosive bombs which commenced to detonate in the dump, F/O. Smith (the unit fire officer) immediately took charge of the fire-fighting operations. With the help of Cpl. Deakin (the N.C.O.-in-Charge of the fire party), F/O. Smith directed the operations to subdue the fire in a most capable and efficient manner for a period of 1½ hours. The fire was fought from very close range, without cover, and eventually it was extinguished. The strenuous work had prevented it from spreading over the whole of the dump. This officer and airman displayed outstanding courage and initiative in the face of great danger, and their actions resulted in much valuable property and material being saved.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Second Bar to Distinguished Flying Cross

Flt. Lt. M. S. ALLEN, D.F.C., R.A.F.V.R., No. 141 Sqn.—By his exceptional skill and co-operation, Flt. Lt. Allen has enabled his captain to

destroy three enemy aircraft since the award of the bar to the D.F.C. This officer has always shown the greatest courage and resourcefulness, and has set a high standard of skill and devotion to duty under adverse conditions.

Flt. Lt. H. E. WHITE, D.F.C., R.A.F.V.R., No 141 Sqn.—Since the award of the first Bar to the D.F.C., this officer has destroyed three enemy aircraft and damaged one while flying as a night fighter pilot. His skill and daring in this capacity have been outstanding. On one sortie, while patrolling near Aachen, he destroyed a Me. 109, which exploded so near and with such brilliance that he was blinded for some moments. He has completed a large number of operational missions.

Bar to Distinguished Flying Cross

Act. Wing Cdr. D. W. S. CLARK, D.F.C., R.A.F.O. and Act. Sqn. Ldr. J. R. DOW, D.F.C., R.C.A.F., both of No. 635 Sqn.—One night in August, 1944, these officers were pilot and navigator respectively of an aircraft detailed to attack Stettin. On the bombing run the aircraft was hit and severely damaged by anti-aircraft fire. One engine was rendered unserviceable and the aircraft was difficult to control. Nevertheless, by cool thinking and excellent co-operation, these officers made a successful attack on the target and brought the aircraft safely back to base. Wing Cdr. Clark and Sqn. Ldr. Dow have completed very many sorties, and have at all times displayed exceptional skill and courage.

Wing Cdr. G. T. B. CLAYTON, D.F.C., R.A.F.O., No. 576 Sqn.—For the past seven months Wing Cdr. Clayton has commanded a heavy bomber squadron. Under his leadership the squadron has acquired a high degree of skill and keenness. He has flown on many difficult and hazardous operations, operating against the enemy in light bombers and night fighters as well as in heavy bombers. The success achieved by this officer is proved by the fine work completed by his squadron during the past months.

Act. Wing Cdr. J. WOODROFFE, D.F.C., R.A.F., No. 61 Sqn.—Wing Cdr. Woodroffe has largely contributed to the successes of his flight by his skill and enthusiasm at all times. Both in the air and on the ground he has set a splendid example, and his leadership is of a high order. As captain of aircraft he has completed operations against targets in Berlin, Leipzig, Nuremberg and Schweinfurt. He has also performed his duties with outstanding competence and resolution during attacks on small targets necessitating the greatest bombing accuracy.

Act. Sqn. Ldr. D. K. ALLPORT, D.S.O., D.F.C., R.A.F.V.R., No. 35 Sqn.—This officer has completed many sorties with a most successful crew. Throughout all his missions, Sqn. Ldr. Allport has shown the utmost determination to reach his objective and press home the attacks from a very low level regardless of opposition. By his skill, courage and coolness under fire, this officer has gained the complete confidence of his crew, and his fine fighting spirit has set a valuable example to other aircrews in the squadron.

Act. Sqn. Ldr. T. W. BLAIR, D.S.O., D.F.C., R.A.F.V.R., No. 83 Sqn.—Since the award of the D.S.O. and D.F.C. Sqn. Ldr. Blair has participated in further numerous sorties against heavily defended objectives with outstanding success. This officer has proved himself at all times to be a navigator of exceptional skill and ability. He has shown the utmost zeal and devotion to duty. His accurate navigation and coolness under enemy fire are worthy of the highest praise.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Flying Cross

Act. Wing Cdr. R. I. ALEXANDER, R.A.F.O., No. 101 Sqn.
Act. Wing Cdr. M. E. PICKFORD, R.A.F., No. 149 Sqn.
Sqn. Ldr. J. C. R. BROWN, R.A.F.O., No. 12 Sqn.
Act. Sqn., Ldr. C. R. BARRETT, R.A.F.V.R., No. 692 Sqn.
Act. Sqn. Ldr. J. D. G. BISHOP, R.A.F.V.R., No. 105 Sqn.
Act. Sqn. Ldr. G. A. HILDRED, R.A.F.V.R., No. 44 Sqn.
Flt. Lt. H. ALMOND, R.A.F.V.R., No. 105 Sqn.
Flt. Lt. P. N. W. BAKER, R.A.F.V.R., No. 77 Sqn.
Flt. Lt. S. T. BEAL, R.A.F.O., No. 692 Sqn.
Flt. Lt. R. W. BELL, R.A.F.V.R., No. 582 Sqn.
Flt. Lt. C. H. BROWN, R.A.F.V.R., No. 105 Sqn.
Flt. Lt. A. E. CLARK, R.A.F.V.R., No. 383 Sqn.
Flt. Lt. D. J. CLARKE, R.A.F.V.R., No. 692 Sqn.
Flt. Lt. H. A. DAVIS, R.A.F.V.R., No 109 Sqn.
Flt. Lt. D. FRANCIS, R.A.F., No. 582 Sqn.
Flt. Lt. H. I. GRAY, R.A.F.V.R., No. 12 Sqn.
Flt. Lt. R. H. HOBDEN, R.A.F.V.R., No. 90 Sqn.
Flt. Lt. D. B. MOYES, R.A.F.V.R., No 431 (R.C.A.F.) Sqn.
Flt. Lt. M. W. O'BRIEN, R.A.F.V.R., No. 192 Sqn.
Flt. Lt. R. A. RATH, R.A.F.V.R., No. 10 Sqn.
Flt. Lt. P. C. STEVENS, R.A.F.V.R., No. 571 Sqn.
Flt. Lt. J. N. G. TILLEY, R.A.F.V.R., No. 582 Sqn.
Flt. Lt. B. S. TURNER, R.A.F.V.R., No. 61 Sqn.
Flt. Lt. R. C. WALKER, R.A.F.V.R., No. 582 Sqn.
Flt. Lt. L. H. WILLIAMS, R.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Flt. Lt. T. F. W. ADDIS, R.A.F.V.R., No. 156 Sqn.
Act. Flt. Lt. H. C. ADMANS, R.A.F.V.R., No. 90 Sqn.
Act. Flt. Lt. K. T. B. ASKINS, R.A.F., No. 102 Sqn.
Act. Flt. Lt. R. F. CHAPLIN, R.A.F.V.R., No. 218 Sqn.
Act. Flt. Lt. J. DOWSETT, R.A.F.V.R., No. 640 Sqn.
Act. Flt. Lt. C. P. HARROLD, R.A.F.V.R., No 109 Sqn.
Act. Flt. Lt. F. R. HATLEY, R.A.F.V.R., No. 582 Sqn.
Act. Flt. Lt. J. A. KELLY, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Lt. R. G. MOSS, R.A.F.V.R., No 582 Sqn.
Act. Flt. Lt. J. H. R. OAKLEY, R.A.F.V.R., No 428 (R.C.A.F.) Sqn.
Act. Flt. Lt. R. D. H. PARKER, R.A.F.V.R., No 97 Sqn.

Air Vice-Marshal H. W. L. Saunders pins the D.F.C. on Flt. Lt. H. Pietrzak, a Polish pilot of Fighter Command.

Act. Flt. Lt. D. RUBERY, R.A.F.V.R., No. 51 Sqn.
Act. Flt. Lt. J. B. SHERRIFF, R.A.F.V.R., No. 432 (R.C.A.F.) Sqn.
Act. Flt. Lt. D. H. SHORTER, R.A.F.V.R., No. 97 Sqn.
Act. Flt. Lt. A. R. S. SMITH, R.A.F.V.R., No 102 Sqn.
Act. Flt. Lt. A. R. TAYLOR, R.A.F.V.R., No. 622 Sqn.
Act. Flt. Lt. A. WHITELEY, R.A.F.V.R., No. 619 Sqn.
Act. Flt. Lt. W. J. WILLIAMS, R.A.F.V.R., No 578 Sqn.
Act. Flt. Lt. W. J. C. YARDLEY, R.A.F.V.R., No. 138 Sqn.
F/O. L. ASHTON, R.A.F., No. 138 Sqn.
F/O. E. V. BENNETT, R.A.F.V.R., No. 51 Sqn.
F/O. G. G. F. BICKERSTAFF, R.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. L. M. BOWEN, R.A.F.V.R., No. 625 Sqn.
F/O. A. S. C. BROWN, R.A.F.V.R., No. 139 Sqn.
F/O. R. C. BRYANT, R.A.F., No. 138 Sqn.
F/O. A. BURGESS, R.A.F.V.R., No. 156 Sqn.
F/O. C. H. CARLTON, R.A.F.V.R., No. 9 Sqn.
F/O. K. G. CHAMBERLAIN, R.A.F.V.R., No. 630 Sqn.
F/O. J. C. CHAPMAN, R.A.F.V.R., No. 582 Sqn.
F/O. G. P. CLARK, R.A.F.V.R., No. 102 Sqn.
F/O. H. W. CORNISH-UNDERWOOD, R.A.F.V.R., No. 617 Sqn.
F/O. F. R. DAVIDSON, R.A.F.V.R., No. 571 Sqn.
F/O. G. P. DAWSON, R.A.F.V.R., No. 578 Sqn.
F/O. S. DEACON, R.A.F.V.R., No. 571 Sqn.
F/O. L. B. A. ELIAS, R.A.F.V.R., No. 13 Sqn.
F/O. D. J. FARR, R.A.F.V.R., No. 692 Sqn.
F/O. S. FISHER, R.A.F.V.R., No. 15 Sqn.
F/O. J. GEDDES, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
F/O. L. G. GOODEY, R.A.F.V.R., No. 192 Sqn.
F/O. H. A. GRAY, R.A.F.V.R., No. 10 Sqn.
F/O. R. G. GRAY, R.A.F.V.R., No. 51 Sqn.
F/O. J. R. GURNEY, R.A.F.V.R., No. 617 Sqn.
F/O. F. HALLAS, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
F/O. R. E. HAWKINS, R.A.F.V.R., No 115 Sqn.
F/O. D. D. T. HILL, R.A.F.V.R., No. 77 Sqn.
F/O. N. H. KIRBY, R.A.F., No. 105 Sqn.
F/O. J. L. KIRNER, R.A.F.V.R., No. 78 Sqn.
F/O. E. LAINCHBURY, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
F/O. M. H. O. LEVIN, R.A.F.V.R., No. 139 Sqn. (since deceased).
F/O. E. C. LITTLE, R.A.F.V.R., No. 199 Sqn.
F/O. R. G. S. FRANKS, R.A.F.V.R., No. 582 Sqn.

SERVICE

F/O. D. V. LONG, R.A.F.V.R., No. 199 Sqn.
F/O. E. MOON, R.A.F.V.R., No. 115 Sqn.
F/O. A. W. MUIRHEAD, R.A.F.V.R., No. 15 Sqn.
F/O. T. W. C. NAIRN, R.A.F.V.R., No 405 (R.C.A.F.) Sqn.
F/O. H. D. OFFICER, R.A.F.V.R., No 78 Sqn.
F/O. N. OWEN, R.A.F.V.R., No 207 Sqn (since deceased).
F/O. S. W. PALMER, R.A.F.V.R., No. 76 Sqn.
F/O C. S. PATON, R.A.F.V.R., No. 57 Sqn.
F/O. C. J. PHILLIPS, R.A.F.V.R., No 434 (R.C.A.F.) Sqn.
F/O. A. PITT, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
F/O. G. POW, R.A.F.V.R., No. 57 Sqn.
F/O M. D. RICHARDS, R.A.F.V.R., No. 571 Sqn.
F/O. W. C. RICHARDSON, R.A.F.V.R., No 692 Sqn.
F/O J. SKELTON, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
F/O. R. G. C. SKINNER, R.A.F.V.R., No. 10 Sqn.
F/O S. F. STEVENS, R.A.F.V.R., No. 161 Sqn.
F/O. A. D. THOMSON, R.A.F., No. 192 Sqn.
F/O. J. F. THOMSON, R.A.F.V.R., No. 97 Sqn.
F/O. H. J. VALLEE, R.A.F.V.R., No 428 (R.C.A.F.) Sqn.
F/O. A. G. W. WADE, R.A.F.V.R., No. 626 Sqn.
F/O. T. B. WALKER, R.A.F., No. 578 Sqn.
F/O. H. WELLAND, R.A.F.V.R., No. 57 Sqn.
F/O. W. A. O. WHITWORTH, R.A.F.V.R., No. 571 Sqn.
F/O J. P. WHYMARK, R.A.F., No. 101 Sqn.
F/O. P. E. WILLSON, R.A.F.V.R., No. 692 Sqn.
F/O. G. L. WILSON, R.A.F.V.R., No. 626 Sqn.
W/O. J. E. DAVIDSON, R.A.F., No. 7 Sqn (For citation, see Sqn. Ldr. Craig, D.S.O., D.F.C.)
F/O F. WOOTTON, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
F/O J. R. YORK, R.A.F.V.R., No. 15 Sqn.
Act. F/O. G. N. HENDERSON, R.A.F.V.R., No. 578 Sqn.
Act. F/O. G. W. JOHNSON, R.A.F.V.R., No. 635 Sqn.
Act. Flt. Lt. J. D. CHAPMAN, R.A.A.F., No. 640 Sqn.
Act. Flt. Lt. R. H. S. FRYER, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. J. W. MULLER, R.A.A.F., No. 97 Sqn.
Act. Flt. Lt. G. A. NOBLE, R.A.A.F., No. 199 Sqn.
Act. Flt. Lt. D. N. RANKIN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. R. W. TRENOUTH, R.A.A.F., No. 622 Sqn.
F/O. P. J. GREY, R.A.A.F., No. 578 Sqn.
F/O. B. L. GOOD, R.A.A.F., No. 622 Sqn.
F/O. C. JAMES, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. E. A. MUSTARD, R.A.A.F., No 463 (R.A.A.F.) Sqn.
F/O. P. R. PETTIT, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. R. J. RAWSTHORN, R.A.A.F., No. 622 Sqn.
Act. Wing Cdr. L. H. LECOMTE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Act. Wing Cdr. G. A. MCKENNA, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. R. C. DEEGAN, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. A. D. R. LOWE, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Flt. Lt. R. B. BARONI, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt. Lt. J. E. DUROCHER, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. C. C. FISHER, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Lt. K. E. JOHNSTON, R.C.A.F., No 429 (R.C.A.F.) Sqn.
Flt. Lt. J. G. LEE, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Flt. Lt. N. G. LOUDOUN, R.C.A.F., No 424 (R.C.A.F.) Sqn.
Flt. Lt A. I. MACDONALD, R.C.A.F., No 429 (R.C.A.F.) Sqn.

Conspicuous Gallantry Medal (Flying)

Flt. Sgt. S. S. CAMPBELL, R.A.F.V.R., No. 39 Sqn.—This airman has proved himself to be a valiant and devoted member of aircraft crew. He has participated in many sorties, including numerous attacks on enemy shipping, and throughout has displayed a high standard of navigational ability. In June, 1944, when over a target in Northern Italy, his aircraft was struck by fragments of shell which started a fire. Flt. Sgt. Campbell was wounded, but, despite this, he succeeded in extinguishing the outburst. He afterwards navigated the aircraft home in the face of great difficulty. Towards the end of July, 1944, this airman was again a member of a crew detailed for an air operation. During the mission his aircraft was damaged by anti aircraft fire. A fire started, but he extinguished it. Although deprived of the full use of navigational aids he guided his pilot safely home. This airman has displayed a high degree of courage and resolution.

Flt. Sgt. R. HARTLEY, R.A.F.V.R., No. 9 Sqn.—As air gunner this airman has taken part in a large number of sorties against many heavily defended targets in Germany. His accuracy, vigilance and determination have been of the highest order, and his devotion to duty unfailing.

Flt. Sgt. R. B. MAXWELL, R.C.A.F., No. 428 (R.C.A.F.) Sqn.—In August, 1944, Flt. Sgt. Maxwell was detailed to attack a target in Germany. When nearing the objective, his aircraft was struck by anti-aircraft fire, disabling an engine and damaging the electrical system. Despite loss of height and a wound in his leg, this airman pressed on to the target, where the bombs had to be released manually. Flt. Sgt. Maxwell then flew his aircraft back to England and effected a safe landing. His coolness, courage and determination to achieve success have been of a high order.

THE KING has been graciously pleased to approve the following awards:—

George Medal

Wing Cdr. B. G. CARROLL, R.A.F., and Flt. Lt. W. TURNER, R.A.F.—In July, 1944, two Typhoon aircraft and a petrol dump were set on fire during an enemy air attack against an airfield. Fire tenders were brought into action and, under the supervision of Wing Cdr. Carroll, the fire in one aircraft was extinguished quickly. A second aircraft, loaded with cannon shells and also carrying rocket projectiles, was burning furiously. Ammunition, petrol tanks and rockets were exploding in all directions. Two rockets, which were pointing towards other aircraft and a dispersal area, remained in the starboard wing. Realising that it was impossible to extinguish the fire, Wing Cdr. Carroll and Flt. Lt. Turner donned asbestos gloves and endeavoured to remove the rockets. This necessitated crawling under the wing and, had the starboard oleo leg collapsed, both officers would probably have been crushed to death. Undaunted by the intense heat and grave danger, these officers succeeded in removing the rockets. Wing Cdr. Carroll also assisted to roll away two 500 lb. bombs which were near the fire. Throughout the whole operation Wing Cdr. Carroll and Flt. Lt. Turner displayed courage and determination of a very high standard and set an excellent example. By their action they nullified a very great potential danger to personnel and aircraft in the vicinity.

Flt. Sgt. J. R. M. St. GERMAIN, R.C.A.F., No. 425 (R.C.A.F.) Sqn.—For citation see Air Comdre. Ross, G.C., O.B.E.

Cpl. M. MARQUET, R.C.A.F., No. 425 (R.C.A.F.) Sqn.—For citation see Air Comdre. Ross, G.C., O.B.E.

B.E.M. (Mil.)

L.A/C. M. M. MCKENZIE, R.C.A.F.—For citation see Air Comdre. Ross, G.C., O.B.E.

L.A/C. R. R. WOLFE, R.C.A.F.—For citation see Air Comdre. Ross, G.C., O.B.E.

A/C.2 V. SKERRITT, R.A.F.—For citation see Sqn Ldr. CHAPMAN, O.B.E.

L.A/C. J. H. TROTTER, R.A.F.V.R.— For citation see F/O. THOMSON, M.B.E.

Cpl. R. A. DEAKIN, R.A.F.V.R.—For citation see F/O. SMITH, M.B.E.

Flt. Sgt. D. H. DUBOULAY, R.A.A.F., No. 149 Sqn.—In June, 1944, this airman was the wireless operator of a Stirling aircraft detailed for a mine-laying operation. The mines were laid successfully, but, almost immediately afterwards, the aircraft was coned by searchlights and subjected to intense and accurate anti-aircraft fire. The bomber was hit in many places; the brakes were rendered useless and the engineer was seriously wounded. On the return journey Flt. Sgt. Duboulay rendered valuable assistance to the navigator and tended the engineer whilst watching his instruments for him. Base was eventually reached but owing to the failure of the brakes, the aircraft ran off the end of the runway and immediately burst into flames. Despite the danger from the exploding petrol tanks and ammunition, Flt. Sgt. Duboulay remained in the blazing aircraft and picked up the wounded engineer. He helped him along the fuselage which was at a very steep angle. This task was rendered doubly difficult as the hydraulic fluid from the mid-upper turret was running down inside the fuselage. Nevertheless Flt. Sgt. Duboulay, displaying complete disregard for his own safety, assisted his comrade to the fuselage door which he succeeded in opening. As the door was some 20 feet from the ground Flt. Sgt. Duboulay was unable to get his comrade to safety unaided. Calling for assistance from the remainder of the crew, who had extricated themselves, Flt. Sgt. Duboulay was able to lower the engineer into their arms. Flt. Sgt. Duboulay's courageous action undoubtedly saved his comrade's life and was an inspiring example to others.

Foreign Decoration

THE KING has granted unrestricted permission for the wearing of the undermentioned decoration conferred upon the officer indicated, in recognition of valuable services rendered in connection with the war:—

Conferred by the Presidium of the Supreme Council of the Union of Soviet Socialist Republics

Order of Kutuzov (First Class)

Air Marshal Sir Trafford L. LEIGH-MALLORY, K.C.B., D.S.O., R.A.F.

Roll of Honour

Casualty Communiqué No. 442.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents, and natural deaths.

Of the names in this list 73 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. H. A. Burrill; F/O. F. A. B. Cameron; L.A/C. L. J. Holt; Cpl. G. Holroyd; Sgt. J. R. Markland; Cpl. H. Pell-Ilderton.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. C. Adey; F/O. S. A. Baldwin; Sgt. L. Hare; F/O. P. T. R. Mercer; P/O. P. R. Raggett.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. F. G. Arliss; Sgt. A. Bailey; Sgt. D. Bailey; Sgt. J. E. H. Bird; F/O. H. E. Carrott; Sgt. F. Cobley; Sgt. W. F. Cox; Sgt. A. H. Davies; Sgt. D. G. St. J. Davies; Sgt. M. I. R. Day; Sgt. A. D. Dufty; Sgt. A. K. Emery; P/O. N. S. Ewart; Sgt. H. T. Finch; Sgt. W. Gilfillan; Sgt. R. C. Graham; Sgt. G. H. Harner; Sgt. E. Hill; Flt. Sgt. J. Hudson; Sgt. R. Hunter; Sgt. R. McK. Innes; Flt. Sgt. C. B. Jolliffe; Sgt. T. Jolly; Act. W/O. F. R. Joy; Sgt. S. T. Kettlety; F/O. W. J. Lake; Sgt. G. W. Laybourn; Flt. Sgt. P. E. Lee; Sgt. H. J. Lewis; P/O. J. G. McComb; Sgt. J. M. McCormack; F/O. D. MacDonald; Act. W/O. A. M. Marshall; Sgt. R. Mather; Sgt. K. Mellor; Sgt. R. H. Morel; Act. Flt. Sgt. F. E. Noble; Sgt. G. Rippingale; Sgt. C. W. Robertson; Sgt. P. Shaw; Sgt. S. G. Short; Flt. Sgt. F. H. Simmonds; F/O. P. W. S. Smallwood; Sgt. W. G. Statham; F/O. D. W. Steeper; Sgt. T. Stewart; Sgt. F. W. Stubbings; P/O. L. T. Thurlby; Sgt. S. Watkins; Flt. Sgt. L. Waters; F/O. S. H. Walker; W/O. J. Wells; Sgt. J. T. Wigley; Sgt. A. F. Williamson; P/O. A. E. Winn; F/O. D. Wood.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. C. E. Ashworth; Air Comdre. G. L. Carter, D.S.O., A.F.C.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. D. Arcus; Sgt. R. S. F. Horn; F/O. J. F. Judd; Sgt. R. E. G. Parnaby; W/O. J. H. Reeves; Sgt. R. Thompson; Sgt. H. T. Varcoe; Sgt. D. A. Wilson.

MISSING.—F/O. G. F. Abbott; Flt. Lt. A. W. Adams; Sgt. K. G. Alsopp; P/O. H. R. Anthony; Sgt. A. D. Baker; Sgt. G. Baker; Sgt. F. E. F. Bale; Flt. Sgt. J. Balmer; F/O. K. S. H. Barker, D.F.M.; F/O. G. T. Basden; Sgt. E. Beard; Sgt. R. Bentley; Sgt. H. D. Birkbeck; F/O. P. D. Blackham; P/O. D. E. Blockley; Sgt. R. W. Boss; Sgt. F. Booth; P/O. K. A. Boyce; Sgt. P. V. Boyter; Sgt. A. Bradley; Sgt. F. H. Brock; Flt. Sgt. E. J. A. Broomfield; Sgt. R. Bryden; P/O. A. W. A. Burnell; Flt. Lt. E. C. Burt, D.F.C.; Flt. Sgt. C. L. Carpenter; P/O. C. Charalambous; Flt. Lt. J. C. Cheetham; Act. Flt. Lt. F. C. W. Clement; F/O. J. A. Cochran; Wing Cdr. P. E. G. G. Connolly; Sgt. G. D. Cooper; Flt. Sgt. D. R. Croker; F/O. F. Crosier; Sgt. L. E. Daglass; Act. F/O. J. E. H. Davies; F/O. N. A. Davies; Sgt. D. A. Donoghue; Flt. Sgt. J. Easton; Sgt. J. R. Eaton; W/O. J. E. R. Ede; F/O. H. W. J. Edwards; Sgt. J. F. P. Edwards; Sgt. J. P. Ewing; W/O. C. T. Fairweather; F/O. M. A. Farr; Sgt. J. Fear; Sgt. I. Feldman; Sgt. F. A. Forster; Act. Flt. Lt. K. W. L. Fuller, D.F.C.; P/O. S. M. Futcher; Sgt. P. Gaffney; Flt. Sgt. J. W. Gibbs; Sgt. W. B. Gladstone; Flt. Sgt. S. W. Godden; Sgt. R. G. Gorick; Sgt. B. J. N. Hackett; P/O. A. Haigh; Sgt. D. Hancock; F/O. W. Hannah; F/O. W. G. Hardcastle; Sgt. J. Healy; Sgt. F. Hellier; P/O. J. Hembry; Flt. Sgt. J. W. Hern; Sgt. G. A. Higgins; Flt. Sgt. P. H. Hodgson; Sgt. A. J. Holmes; P/O. T. J. Hordley; Flt. Sgt. R. F. Houghton; Sgt. W. I. Howitt; Sgt. R. R. Hughes; Sgt. M. C. Hunt; Sgt. H. Ibbs; Flt. Sgt. C. Jackson; Sgt. R. Jacques; Flt. Sgt. D. V. Joy; Sgt. J. J. Kearney; Sgt. J. T. Kermack; Flt. Sgt. S. F. Kirkland; Sgt. A. J. Knight; Sgt. J. B. Lawrie; Flt. Lt. H. A. Lightbody; Sgt. E. J. Line; Sgt. N. D. Little; Sgt. E. C. P. Lloyd; Sgt. L. J. Lucas; Sgt. H. C. Luton; Flt. Sgt. D. McDonagh; Sgt. D. B. MacKenzie; Sgt. J. M. McLachlan; Flt. Sgt. J. McC. McMaster; Sgt. J. A. Macktin; F/O. D. H. Maling; Sgt. G. C. Marriott; Sgt. E. J. Marshall; Sgt. W. Marshall; F/O. E. C. Martin; Sgt. N. H. Maughan; Sgt. C. S. Menzies; P/O. J. H. Meyer; Sgt. G. C. R. Mickelfield; Sgt. E. W. Mickleborough-Saunders; Sgt. A. W. Middleton; F/O. D. W. Muir; Sgt. M. Muir; Sgt. J. D. Naunton; Sgt. R. Nevill; Sgt. R. J. Norman; F/O. N. Nunns; Flt. Sgt. J. Palmer; Sgt. F. Peirson; Sgt. J. Pender; Sgt. J. R. Penton; Flt. Sgt. F. Phillips; Flt. Sgt. H. Pollard; Sgt. R. D. Potter; Sgt. J. T. Price; Sgt. C. M. Pyke; F/O. W. H. C. Ramsay; Sgt. D. W. Rawson; Sgt. W. Ray; F/O. G. D. Reen; Sgt. A. Relton; Sgt. J. A. Richards; Flt. Lt. G. C. Robinson; Flt. Sgt. J. Rumney; W/O. E. A. Rushmere; Sgt. S. J. Saunders; Sgt. A. L. Sayers; Sgt. T. Setchfield; F/O. E. R. Shepherd; Act. Flt. Lt. J. Skingley; Flt. Sgt. L. J. Smith; Flt. Sgt. P. N. Smith; F/O. H. M. Steward; Flt. Sgt. W. Stewart; W/O. W. H. Stiffin; Flt. Sgt. F. H. Stokeld; Sgt. V. C. A. Stokes; Flt. Sgt. J. H. Storey; Sgt. G. T. Sutherland; Sgt. G. Taylor; Flt. Sgt. J. E. Taylor; Sgt. W. H. Taylor; Sgt. R. F. Torrance; Sgt. A. H. Treadwell; Sgt. G. H. Tucker; Act. Flt. Lt. G. R. Underhill; Sgt. W. R. Urwin; Flt. Lt. A. D. Wagner, D.F.C.; Sgt. W. Wass; F/O. G. Watkins; Sgt. C. J. Watson; F/O. E. J. Welchman; Sqn. Ldr. R. H. Weston; F/O. W. B. Wilkinson; Flt. Lt. J. I. Williams; Sgt. F. D. Wills; Act. Flt. Lt. G. R. Wood; Sgt. M. G. Wod; Sgt. N. L. Wood; Sgt. L. J. Worrall; Flt. Sgt. J. L. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. A. P. R. Hobbs.

KILLED ON ACTIVE SERVICE.—Flt. Lt. R. L. Brown; Sgt. T. Chambers; Sgt. R. Cook; L.A/C. D. L. Lumpkin; Sgt. A. K. Moneur; Sgt. R. O. Stagg.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. H. M. Garner; Sgt. R. F. Kincaid; Sgt. J. W. Mann.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. H. C. Cox; L.A/C. J. Guyler.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. G. C. Morgans; L.A/C. R. C. Tebby.

DIED ON ACTIVE SERVICE.—L.A/C. S. W. Clark; A/C.1 J. Coope; Act. Cpl. G. P. R. Godden; A.C.2 F. J. Kittle; Cpl. H. Taylor.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. P. Dormand, D.F.C.

(Left) Air Vice-Marshal V. E. Groom, C.B., C.B.E., D.F.C., who is S.A.S.O. of the 2nd T.A.F. (Right) Air Vice-Marshal T. W. Elmhirst, C.B.E., A.F.C., Air Officer Administrative of 2nd T.A.F.

SERVICE AVIATION

Royal Australian Air Force

KILLED IN ACTION.—Flt. Lt. D. E. J. Gardiner.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. F. Altus; F/O. K. J. Trask; Act. Wing Cdr. A. R. Gibbes, D.F.C.

WOUNDED OR INJURED IN ACTION.—W/O. J. L. Finch.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. J. H. Abraham; Act. F/O. D. A. Barlow; Flt. Sgt. M. R. Jones; Flt. Sgt. J. O. Ohlson; Flt. Sgt. R. K. Scott.

MISSING.—Flt. Sgt. C. A. Barlow; W/O. H. C. Bell; F/O. C. M. Clarey; W/O. I. H. Clark; W/O. G. J. Custance; Flt. Sgt. D. J. Davey; Flt. Sgt. E. J. Freame; Flt. Sgt. J. W. Houseman; Act. Flt. Lt. G. N. Marchant; Flt. Sgt. C. K. Mollett; Flt. Sgt. A. J. W. Mudford; P/O. A. G. Rodgers; W/O. R. W. Russell; P/O. M. Rose; Act. Flt. Lt. P. E. Sinclair, D.F.C.; P/O. J. A. Solomon.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. B. K. White.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. R. E. Lemmon.

MISSING, BELIEVED KILLED IN ACTION.—F/O. J. W. H. Conway; P/O. D. N. Cotton; P/O. H. J. Kennedy.

MISSING.—P/O. D. F. J. Baxter; F/O. J. A. R. Belanger; Sgt. E. W. Bookhout; F/O. H. W. Bowker; F/O. J. S. Brown; Flt. Sgt. H. T. B. Burgess; W/O. H. R. Carruthers; Sgt. J. Crawford; F/O. D. Elphick; P/O. W. Fernyhough; F/O. N. V. Gautschi; Sgt. J. M. Hickey; Sgt. R. F. Hillman; F/O. G. S. Kimber; F/O. A. G. Kinnis; W/O. C. D. Knox; Sgt. E. J. McCloskey; F/O. H. J. McEcachern; P/O. R. McEwan; F/O. E. W. MacIntosh; Sgt. L. McLean; F/O. K. A. Moderwell; P/O. J. V. Musser; Flt. Sgt. C. J. O'Connor; F/O. F. G. Paterson; Sgt. J. I. S. Patterson; Sgt. D. Shoobridge; Flt. Sgt. A. C. Sutherland; P/O. B. E. Vipond; Sgt. W. A. Waldram; F/O. J. Wenger; F/O. G. A. White; Flt. Sgt. J. Wright.

DIED ON ACTIVE SERVICE.—F/O. R. A. Pearson.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. C. C. Duncan; Flt. Sgt. H. G. Scott.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. H. Tong.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. W. R. Kell; Flt. Sgt. J. A. Lamb; Flt. Sgt. G. W. Tindle.

MISSING.—P/O. W. Boocock; Act. F/O. M. C. Eckhold; W/O. E. J. W. Stirling.

South African Air Force

KILLED IN ACTION.—Lt. J. Pinar; Capt. H. W. Solms.

WOUNDED OR INJURED IN ACTION.—W/O. G. M. E. Botha; Lt. F. Botha.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—W/O. N. B. Nelson-Berg.

MISSING.—W/O. H. A. Annandale; 2/Lt. P. A. Armstrong; W/O. E. R. Beznidenhout; W/O. D. F. De Kock; W/O. D. E. Doualliier; Lt. P. Naylor; Lt. B. J. Van Derhmerwe; Lt. J. C. Webb.

KILLED ON ACTIVE SERVICE.—Maj. D. W. Maree, D.F.C.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Lt. E. I. H. Sturgeon, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Capt. A. C. Warner.

Indian Air Force

DIED ON ACTIVE SERVICE.—F/O. V. R. Saigol.

Casualty Communique No. 443

Of the names in this list 74 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. P. Dicerbo; F/O P. C. McIntosh.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—A/C.2 H. R. Aves; P/O. J. Bennett; Sgt. W Brown; W/O. M. G. Clynes; Sgt. A. E. Eley; Sgt. D. A. J. Fisher; W/O. J. H. Gillies; A/C.2 J. D. Hames; L.A/C. P. G. Hodgkins; A/C.2 R. Hurley; A/C.2 W. Kennedy; Sgt. R. R. Mutton; Flt. Sgt. T. W. Pearman; Sgt. C. W. Phillips; Flt. Sgt H. C. Seymour; A/C.2 D Shaw; A/C.2 A. E. Wort.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. E. Ashton; Sgt. P. Barton; Sgt. A. S. Bissett; Sgt. J. Black; Sgt. G. D. Dodson; Flt. Sgt. R. L. Fennel; Sgt. J. Forrest; Flt. Sgt. M. G. Fraser; Sgt. E. H. Gold; Act. W/O. L. E. F. Green; Flt. Sgt. A. Griffin; Flt. Sgt. M. F. Hall; Sgt. F. W. Harris; Sgt. C. H. Hollingsworth; Sgt. E. F. Hudson; Sgt. T. Lackenby; Flt. Sgt. M. H. Lamont; Sgt. G. F. Lawrence; F/O. C. J. MacPherson; Sgt. J. E. McQuade; Sgt. C. J. Massie; Sgt. H. J. Middleton; Flt. Sgt. W. H. Milne; Sgt. G. A. Muffett; Sgt. R. Musgrove; Sgt. J. P. Nevillt; Sgt. J. H. Pepper; Sgt. L. Pow; Flt. Sgt. W. B. Ralph; Sgt. A. Robinson; Flt. Lt. I. B. Small; Sgt. G. W. Smith; Act. W/O. S. W. Smith; F/O. E. E. Tatt; Sgt. J. Taylor; Sgt. E. Thorpe; Sgt. C. W. Torbett; Sgt. A. D. West; Flt. Sgt. E. H. Willcocks; Sgt. L. R. Wright.

WOUNDED OR INJURED IN ACTION.—Sgt. J. B. S. Berwick.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. S. Scott.

MISSING.—F/O. P. J. Abbott; Flt. Sgt. J. S. Archibald; Flt. Sgt. S. B. Ashton; Sgt. D. Austin; Act. Flt. Lt. G. E. Ball, D.F.C.; Flt. Sgt. G. Bennett; Sqn. Ldr. S. P. V. Bird; Sgt. C. Booth; Sgt. P. H. Bowen; Flt. Sgt. F. W. Bull; Act. Flt. Lt. C. J. Burnell; Sgt. W. R. Bush; Sgt. T. H. B. Carden; Sgt. C. N. Clayton; F/O. K. P. McL. Cran; Sgt. G. Cunninghaun; Flt. Sgt. D. A. Davies; Sgt. J. A. Findlay; F/O. N. T. Foster; Sgt. R. F. Gannon; P/O. W. T. Gilmore; P/O A. G. Gleeson; Sgt. W. H. M. Greig; Sgt. A. F. Grieve; Flt. Lt. the Hon. B. D. Grimston, D.F.C.; Sgt. L. J. Guest; Sgt. R. N. Harper; P/O. J. A. Harrison; W/O. J. C. B. Harrison; P/O. C. Hart; Flt. Sgt. A. E. S. Holt; Sgt. H. H. Howies; Flt. Sgt. J. B. Johnson; Sgt. C. L. Jones; Sgt. P. H. Keeler; P/O. C. W. Keighley; P/O. J. Kernahan; Sgt. P. R. Kewn; Sgt. J. A. Kirwan; Sgt. S. F. Labern; Flt. Sgt. P. Lake; Flt. Sgt. B. Lansley; Sgt. R. G. Lappin; Sgt. W. H. Latham; Flt. Sgt. A. A. Lee; Sgt. F. D. P. Longman; F/O. W. Lowe; Sgt. J. F. McHugh; Flt. Lt. A. W. Manson; Flt. Sgt. M. E. Marriott; Flt. Sgt. D. Marrows; Sgt. D. G. Marsden; F/O. S. M. Masters; P/O. G. Millar; Sgt. G Miller; Sgt. E. Mitchell; Sgt. J. A. Mitchell; Sgt. J. M. Mitchinson; F/O. R. J. Moore; Sgt. K. Paine; Flt. Sgt. G. J. W. Parkinson; Sgt. F. H. Patten; Sgt. G. Peace; P/O. H. Pearson; Flt. Sgt. R. Radford; Sgt. D. A. T. Roffey; Sgt. F. E. Shaw; W/O. R. A. Simpson; Sgt. E. F. Storrie; Sgt. R. E. Thomas; W/O. M. Tilmont; F/O. K. A. J. Trott; Sgt. E. Wardman; Act. F/O. N. L. Weekes; Flt. Sgt. E. H. Wells; Sgt. L. P. Whelan; Sgt. M. Whiteley.

KILLED ON ACTIVE SERVICE.—F/O. H. J. Bennet; Sgt. H. Buckley; Cpl. S. E. Coles; W/O. M. G Cross; F/O. P. Davie; A/C.2 T. W. Davies; Sgt. J. B. Fairservice; Sgt. N Fox; W/O. W. Hobman; Sgt. G. W. Horford; Sgt. S. Houston; Sgt. A. S. A. Johnson; F/O J. B. Josling, D.F.C.; A/C.2 J. Lawson; Sgt. W. L. Martindale; Sgt. J. Mitchison; Sgt. W. J. Morgan; Flt. Sgt. C. Oddy; Sqn. Ldr. E. G. Outram-White; Sgt. R. W. Parker; P/O. N. J. Shand; F/O. K. E. E. Sillitoe; Sgt. M. Wilkinson; Sgt. H. L. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. J. S. Heasman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. W. H. Beal; W/O. A. C. Fussell; A/C.1 R. McCool.

DIED ON ACTIVE SERVICE.—L.A/C. J. C. Hargreaves; Act. Wing Cdr. C. E. H. C. MacPherson; A/C.2 G. R. Pegg; Cpl. F. R. Skinner; Sgt. W. H. Stewart; Flt. Lt. H. Webb; Cpl. L. W. Williams; L.A/C. J. Wright.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 P. Smith.

Royal Australian Air Force

MISSING.—Flt. Sgt. G. E. Beckhouse; Flt. Sgt. D. G. W. Brown; Flt. Sgt. B. M. Joyce; Sgt. M. H. Payne; Flt. Sgt. A. D. Tagget.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. W. Evans; F/O. D. J. Hegarty; W/O G H. Minchin; Flt. Sgt. D. H. Wilson.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. L. B. MacKay.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. M. Chepil; F/O. J. Craig; Sgt. R. G. Edwards; F/O. E. L. Fairweather; Flt. Sgt. W. M. Haugen; Flt. Sgt. A. E. Leake; F/O. A. B. Long; F/O. H. S. McIntyre; Flt. Sgt. E. G McLeod; F/O. C. H. McMinniman; F/O. H. P. Shann; Flt. Sgt. E. H. Spanke; P/O. V. T. Sylvester; Flt. Sgt. H. F. Thurston; Act. Sqn. Ldr. R. P. Wilkin, D.F.C.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. J. K. Allison.

MISSING.—F/O J. F. Armstrong; W/O. J. Bicknell; W/O. J. D. Bishop; F/O. A. J. Faulkner; F/O. L. R. Fennell; Sgt. C. J. Glenny; F/O. W. A. M. Hallett; W/O. F. R. Hopkins; F/O. W. J. Long; Flt. Sgt. T. H. Lunnin; Sgt. G. F. McLaurin; Flt. Sgt F. G. Maltais; Sgt. J. Manning; F/O. A. J. Morrison: W/O. S. A. Motriuk; Flt. Sgt. P. O. K. Noren; P/O. G. A. Rae; F/O. F. W Schwartz; W/O. D. D. C. Stewart.

KILLED ON ACTIVE SERVICE.—P/O. G. H. Atkinson; Sgt. W. S. Barnard; F/O. J. W. Blyth; Cpl. R. E. Coiwell; F/O. S. J. Joplin; Flt. Sgt. G. A. Kent; P/O. F. E. McDonald; W/O. W. L. Mitchell; P/O. A. G. Vautour; Sgt. J. M. Wilson.

Air Marshal Sir Francis J. Linnell formerly deputy Air C-in-C. Middle East, who was killed recently in a road accident in Oxfordshire.

Royal New Zealand Air Force

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Act. Sqn. Ldr. M. R. B. Ingram.

MISSING, BELIEVED KILLED IN ACTION.—W/O. R. A. P. Opie.

MISSIN.—Flt. Sgt. W. B. Hunniford; Act. F/O. J. K. McRae; Flt. Sgt. T. C. Potts.

KILLED ON ACTIVE SERVICE.—Flt. Lt. A. L. Ray.

South African Air Force

WOUNDED OR INJURED IN ACTION.—2/Lt. D. W. Barnard; Lt. L. S. Coughlan; Lt. K. T. F. Ryan.

MISSING.—Maj. H. R. L. Alder; Lt. T. A. Bamber; Lt. Col. M. Branby, D.F.C.; Lt. H. G. Chapman; W/O. R. H. Empey; Capt. R. T. Hutchinson; W/O. J. Lees; Lt. D. H. McHughs; Lt. F. A. O'Connor; W/O. J. L. Rodgers; Lt. T. V. Vlok; W/O. M. Zeff.

DIED ON ACTIVE SERVICE.—Air Mech. H. N. Morton.

Official Corrections

Casualty Communiqué No. 438.

Under "MISSING," for Sgt. G. E. Snelling read Flt. Sgt G. E. Snelling. Delete Flt. Sgt. W. F. Wicks.

Under "KILLED ON ACTIVE SERVICE," for W/O. T. J. Malone read Sgt. T. J Malone.

Under "PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE," delete Act. Flt. Sgt. J. Williams.

Under "DIED ON ACTIVE SERVICE," for A/C.1 F. W. Parrott read L.A/C. F. W. Parrott.

Under "PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR," delete Sgt. G. W. Green.

R.C.A.F.—Under "MISSING, BELIEVED KILLED IN ACTION," for W/O. Blaydes read P/O. H. Blaydes.

Under "MISSING," delete Flt. Sgt. L. S. O'Leary. Under "KILLED ON ACTIVE SERVICE," for P/O. A. G. Corck read F/O. A. G. Corck, and for P/O. L. A. Scutt read F/O. L. A. Scutt.

Casualty Communiqué No. 439.

Under "MISSING," delete Flt. Lt. A. C. Flood and Flt. Lt. E. W. Forwell. For Sgt. K. Nelson read Flt. Sgt. K. Nelson.

R.C.A.F.—Under "KILLED IN ACTION," for W/O. C. J. McConvey read P/O. L. J. McConvey.